THE OFFICE OF ENVIRONMENTAL MANAGEMENT TECHNICAL REPORTS

A Bibliography
January 1996

Prepared for
The Office of Science
and Technology

Prepared by
Office of Scientific and
Technical Information

OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

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Office of Scientific and Technical
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U.S. DEPARTMENT OF ENERGY
P.O. Box 62
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Department of Energy
Germantown, MD 20874-1290

July 9, 1996

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Sincerely,

A handwritten signature in cursive script that reads "Diana Krop".

Diana Krop
Office of Technology Integration
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**The Office of Environmental Management
Technical Reports
A Bibliography**

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U.S. DEPARTMENT OF ENERGY

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ABOUT THIS BIBLIOGRAPHY

The Office of Environmental Management's (EM) technical reports bibliography is an annual publication that contains information on scientific and technical reports sponsored by the Office of Environmental Management added to the Energy Science and Technology Database from July 1, 1994 – June 30, 1995. This information is divided into the following categories: **Focus Areas**, **Cross-cutting Programs**, and **Support Programs**. In addition, a category for general information is included. EM's Office of Science and Technology sponsors this bibliography. Questions regarding the content of the publication should be addressed to Diana Krop, Communications Program Manager, at 301-903-7918 or Diana.Krop@em.doe.gov

PROGRAM ACTIVITIES

The Office of Environmental Management within the Department of Energy (DOE) is responsible for environmental restoration, waste management, technology development and facility transition and management. This Office was created in 1989 to consolidate responsibility within DOE for environmental management activities. EM develops DOE policies and plans related to environmental restoration and waste management and is working to foster open communication with the public.

The Office of Science and Technology (OST) was established to conduct an aggressive, national program of applied research, development, demonstration, testing, and evaluation for environmental cleanup solutions that are safe and more time- and cost-effective than those currently available. OST brings together experts from academia, the Federal government, and private industry to conduct a wide range of research and development. Through these unique partnerships, OST leverages resources to develop equipment and methods to render waste management technologies less expensive, safe, and commercially applicable around the globe. In doing so, OST seeks to achieve the twin goals of sustaining our environment and creating economic prosperity.

AVAILABILITY

A searchable EM Technical Reports database is now available from EM's home page via the World Wide Web. The database contains information on scientific and technical reports sponsored by EM from 1989 to present and is searchable by title, focus area, author, performing organization, DOE report number, publication date, and abstract. The records since July 1, 1994, are searchable by all focus and crosscutting areas. The Internet address is: <http://www.em.doe.gov>

DOE and DOE Contractors can obtain copies from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information call, (423) 576-8401.

Public availability is from the U.S. Department of Commerce, Technology Administration, National Technical Information Service, Springfield, VA 22161. For further information call (703) 487-4650.

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How To Read A Citation

The principal data elements included in these citations are:

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Sample Citations

Report

18494 (DOE/ER/40438-T1) [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report. Haeblerli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU-69, pp. 30-32) Transition energies in Ne-like ions. Correlation effects. Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection*. Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.
SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) Investigation of air pollution in house due to use of various fuels. Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In *Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report*. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO₂ and NO₂). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in 30m² air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Use the Indexes

Five indexes are provided for approaching the content of *The Office of Environmental Management Technical Reports*. Descriptions of entries in these indexes follow.

Corporate Author Index

The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index

Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., See Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

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This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES

See also DEUTERIUM
HYDROGEN 4
TRITIUM

Neutron-Rich Isotopes

Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index

DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 Wisconsin Univ., Madison (USA).
Dept. of Physics
15:18494 DOE/ER/40438-T1
FG02-88ER60664 Rogers and Associates
Engineering Corp.,
Salt Lake City, UT (USA)

Report Number Index

Technical report literature is indexed by the alpha-numerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is shown.

DOE/ER/40438- T1 15:18494 NTIS, OSTI
E 1.99: DE89007246 MF-411

Environmental Management Technical Reports

GENERAL

Refer also to citation(s) 19, 445

1 (ANL/EA/CP-80973) **Hazardous waste database: Waste management policy implications for the US Department of Energy's Environmental Restoration and Waste Management Programmatic Environmental Impact Statement.** Lazaro, M.A. (Argonne National Lab., IL (United States)); Policastro, A.J.; Antonopoulos, A.A.; Hartmann, H.M.; Koebnick, B.; Dovel, M.; Stoll, P.W. Argonne National Lab., IL (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225-68: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008103. Source: OSTI; NTIS; INIS; GPO Dep.

The hazardous waste risk assessment modeling (HaWRAM) database is being developed to analyze the risk from treatment technology operations and potential transportation accidents associated with the hazardous waste management alternatives. These alternatives are being assessed in the Department of Energy's Environmental Restoration and Waste Management Programmatic Environmental Impact Statement (EM PEIS). To support the risk analysis, the current database contains complexwide detailed information on hazardous waste shipments from 45 Department of Energy installations during FY 1992. The database is currently being supplemented with newly acquired data. This enhancement will improve database information on operational hazardous waste generation rates, and the level and type of current on-site treatment at Department of Energy installations.

2 (ANL/EA/CP-84165) **Development of chemical profiles for U.S. Department of Energy low-level mixed wastes.** Wang, Y.Y.; Wilkins, B.D.; Meshkov, N.K.; Dolak, D.A. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-102: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008284. Source: OSTI; NTIS; INIS; GPO Dep.

Chemical and radiological profiles of waste streams from US Department of Energy (DOE) low-level mixed wastes (LLMWs) have been developed by Argonne National Laboratory (ANL) to provide technical support information for evaluating waste management alternatives in the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS). The chemical profiles were developed for LLMW generated from both Waste Management (WM) operations and from Environmental Restoration (ER) activities at DOE facilities. Information summarized in the 1994 DOE Mixed Waste Inventory Report (MWIR-2), the Pacific Northwest Laboratory (PNL) Automated Remedial Assessment Methodology (ARAM), and associated PNL supporting data on ER secondary waste streams that will be treated in WM treatment facilities were used as the sources

for developing chemical profiles. The methodology for developing the LLMW chemical profiles is discussed, and the chemical profiles developed from data for contact-handled (CH) non-alpha LLMW are presented in this paper. The hazardous chemical composition of remote-handled (RH) LLMW and alpha LLMW follow the chemical profiles developed for CH non-alpha LLMW.

3 (ANL/EA/CP-85594) **Development of radiological profiles for U.S. Department of Energy low-level mixed wastes.** Wilkins, B.D.; Meshkov, N.K.; Dolak, D.A.; Wang, Y.Y. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-100: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008280. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological profiles have been developed by Argonne National Laboratory for low-level mixed wastes (LLMWs) that are under the management of the US Department of Energy (DOE). These profiles have been used in the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS) to support the analysis of environmental and health risks associated with the various waste management strategies. The radiological characterization of DOE LLMWs is generally inadequate and has made it difficult to develop a site- and waste-stream-dependent radiological profile for LLMWs. On the basis of the operational history of the DOE sites, a simple model was developed to generate site-dependent and waste-stream-independent radiological profiles for LLMWs. This paper briefly discusses the assumptions used in this model and the uncertainties in the results.

4 (ANL/EA/SUMM-84626) **Activities of HPS standards committee in environmental remediation.** Stencel, J.R. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Chen, S.Y. Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC02-76CH03073. (CONF-941102-Summ.: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994; PPPL-CFP-3088; PPPL-CFP-3178). Order Number DE95004661. Source: OSTI; NTIS; INIS; GPO Dep.

The Health Physics Society (HPS) develops American National Standards in the area of radiation protection using methods approved by the American National Standards Institute (ANSI). Two of its sections, Environmental Health Physics and Contamination Limits, have ongoing standards development which are important to some environmental remediation efforts. This paper describes the role of the HPS standards process and indicates particular standards under development which will be of interest to the reader. In addition, the authors solicit readers to participate in the voluntary standards process by either joining active working groups (WG) or suggesting appropriate and relevant topics which should be placed into the standards process.

5 (CONF-930873-, pp. 8.1.1-8.1.9) **Needed sampling and analytical methods for the document: "DOE Methods for Evaluating Environmental and Waste Management Samples"**. Goheen, S.C. (Pacific Northwest Lab., Richland, WA (United States)); Riley, R.G.; Fadeff, S.K.; Sklarew, D.S.; Mong, G.M.; Cosby, W.C.; McCulloch, M.; Brug, W.P.; Poppiti, J.S. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

The document "DOE Methods for Evaluating Environmental and Waste Management Samples" (DOE Methods) contains methods that give guidance for sampling and analyzing mixed waste and environmental samples from DOE sites. The document was first issued in October, 1992, and is updated every six months. New sampling and analytical methods that have successfully completed the DOE Methods review process are added with each update. Identification of methods needed to address relevant concerns to DOE and that are not included in existing standard methods is an important part of this process. Categories in the areas of organic, inorganic, radiochemistry, miscellaneous analytical, and sampling have been classified. These categories identify types of methods needed to complete DOE Methods. Some categories show gaps that are not addressed by existing standard methods. The method needs have been prioritized to emphasize sampling and analysis in radioactive waste and environmental matrices. Based on an evaluation of over 1,000 procedures compiled from sites from across the DOE complex and currently in the DOE Compendium Procedures Database, several hundred specific organic, inorganic, radiochemistry, and sampling method needs for future inclusion in DOE Methods have been identified. The needs lists depicted in this paper are presented as guidance to DOE, DOE contractors, and commercial contractors interested in submitting methods for consideration for possible inclusion in DOE Methods. The authors encourage feedback from readers on the content of the lists. All feedback will be given serious consideration in future updates of the needs lists.

6 (CONF-940853-10) **Waste management technology logic diagrams for environmental remediation at Department of Energy Sites**. Singh, S.P.N. (Oak Ridge National Lab., TN (United States)); Fellows, R.L. Oak Ridge National Lab., TN (United States). [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Summer meeting of the American Institute of Chemical Engineers; Denver, CO (United States); 14-17 Aug 1994. Order Number DE94019323. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy/Office of Technology Development (DOE/OTD) is actively examining cleanup technologies to remediate its aging nuclear production facilities. A part of this effort is to develop "technology logic diagrams" (TLDs) to identify the potential wastes and their treatment processes. Huge quantities of radioactive and mixed wastes are expected to be produced during the decontamination and decommissioning of the facilities and the remediation of the contaminated soils, waters, and other polluted areas at these sites. Efficient separation processes need to be identified to manage the large number of wastes

to minimize the cleanup costs and their environmental impacts. One objective of developing the TLDs is to identify technologies that can treat the wastes most efficiently and at the lowest cost. This paper addresses the results of the TLD development for the DOE's K-25 and the Oak Ridge National Laboratory sites. The TLD effort estimated the types and quantities of the wastes expected to be produced and identified the technologies that could be used to manage these wastes. The treatment processes that we examined ran the gamut from commercial processes to innovative developmental technologies. The status of each treatment technology and the development effort needed to commercialize the technology were also assessed. Priorities for developing some of the promising new technologies are also recommended in the TLDs.

7 (DOE/CH/10618-T2) **Description of the US Geological Survey's slug-test and borehole geophysical logging work at the Hallam Nuclear Facility, July to November 1994**. Geological Survey, Lincoln, NE (United States). Water Resources Div. 1 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States); Department of the Interior, Washington, DC (United States). DOE Contract AI02-94CH10618. Order Number DE95010351. Source: OSTI; NTIS; INIS; GPO Dep.

Four aquifer slug-tests were performed in two observation wells 1B and 4C at Hallam Nuclear Facility, Nebraska. Well 1B responded more rapidly than 4C. Borehole geophysics data were collected in observation wells 1B, 4C, B-4, B-8, and B-10 on November 3.

8 (DOE/EM-0109P-Rev.1) **Office of Technology Development FY 1993 program summary; Office of Research and Development, Office of Demonstration, Testing and Evaluation: Revision 1**. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Feb 1994. 224p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017314. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes significant FY93 programmatic information and accomplishments relevant to the individual activities within the Office of Technology Development Program for Research, Development, Demonstration, Testing, and Evaluation (RDDT&E). A brief discussion of the mission of the Office of Environmental Restoration and Waste Management (EM) and the Office of Technology Development is presented. An overview is presented of the major problem areas confronting DOE. These problem areas include: groundwater and soils cleanup; waste retrieval and processing; and pollution prevention. The organizational elements within EM are highlighted. An EM-50 Funding Summary for FY92 and FY93 is also provided. RDDT&E programs are discussed and their key problem areas are summarized. Three salient program-formulating concepts are explained. They are: Integrated Demonstrations, Integrated Programs, and the technology window of opportunity. Detailed information for each of the programs within RDDT&E is presented and includes a fact sheet, a list of technical task plans and an accomplishments and objectives section.

9 (DOE/EW/50619-T1) **A proposed framework for establishing integrated cost and performance criteria for environmental technologies. A summary report to the U.S. Department of Energy**. National Environmental Technology Applications Center, Pittsburgh, PA (United States); Environmental Protection Agency, Washington, DC

(United States). Office of Research and Development. May 1994. 49p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States). DOE Contract AI01-92EW50619. Agreement CR-815286-01-1. Order Number DE95007491. Source: OSTI; NTIS; INIS; GPO Dep.

Through an Interagency Agreement between the US Environmental Protection Agency (EPA) and the US Department of Energy (DOE), EPA directed a project to establish a suite of standard cost and performance criteria to guide the evaluation of environmental cleanup technologies for DOE sites. Ideally, these criteria would be "generic" in that they could be used as a basis for evaluating any cleanup technology for any DOE site. To be most useful, however, these criteria would also reflect the interests of diverse decisionmakers who influence DOE technology evaluation. The project was conducted by the National Environmental Technology Applications Center (NETAC), a nonprofit organization specializing in the development and commercialization of new and innovative environmental technologies for national and international markets. To accomplish the project objective, NETAC (1) developed a data gathering questionnaire, (2) interviewed government and industry decisionmakers, (3) identified previous criteria development efforts, (4) conducted a workshop, (5) evaluated workshop discussions, and (6) applied its five years' experience in commercializing environmental technologies to analyze project findings. The project resulted in the development of a unique and comprehensive resource or tool to enhance communication among decisionmakers. This resource, a "Proposed Framework for Establishing Integrated Cost and Performance Criteria for Evaluating Environmental Cleanup Technologies for DOE Sites," offers decisionmakers a first-time comprehensive assessment of major technology evaluation issues by a decisionmaker group.

10 (DOE/OR-1001/R3) Oak Ridge Reservation Site Management Plan for the Environmental Restoration Program. Oak Ridge National Lab., TN (United States). Jun 1994. 139p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3174). Order Number DE94014052. Source: OSTI; NTIS; INIS; GPO Dep.

This site management plan for the Oak Ridge Reservation (ORR) describes the overall approach for addressing environmental contamination problems at the ORR Superfund site located in eastern Tennessee. The ORR consists of three major US Department of Energy (DOE) installations constructed in the early to mid 1940s as research, development, and process facilities in support of the Manhattan Project. In addition to the three installations – Oak Ridge National Laboratory (ORNL), the Oak Ridge Y-12 Plant, and the Oak Ridge K-25 Site (formerly the Oak Ridge Gaseous Diffusion Plant) – the ORR Superfund Site also includes areas outside the installations, land used by the Oak Ridge Associated Universities and waterways that have been contaminated by releases from the DOE installations. To date, ~ 400 areas (Appendix A) requiring evaluation have been identified. Cleanup of the ORR is expected to take two to three decades and cost several billion dollars. This site management plan provides a blueprint to guide this complex effort to ensure that the investigation and cleanup activities are carried out in an efficient and cost-effective manner.

11 (DOE/OSTI-3411) The Office of Technology Development technical reports. A bibliography. USDOE Office of Scientific and Technical Information, Oak Ridge,

TN (United States). Sep 1994. 920p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014096. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy's Office of Technology Development (OTD) within the Office of Environmental Management was established in 1989 to conduct an aggressive national program of applied research, development, demonstration, testing, and evaluation (RDDT&E) for innovative environmental cleanup solutions that are safer and more time- and cost-effective than those currently available. In many cases, the development of new technology presents the best hope for ensuring a substantive reduction in risk to the environment and improved worker/public safety within realistic financial constraints. Five major remediation and waste management problem areas have been identified to date within the DOE weapons complex; Contaminant Plume Containment and Remediation; Mixed Waste Characterization, Treatment, and Disposal; High-Level Waste Tank Remediation; Landfill Stabilization; and Facility Transitioning, Decommissioning, and Final Disposition. New technologies to address these problem areas are demonstrated to the point that they are proven to work and that they can be transferred to the private sector end-users. This bibliography contains information on scientific and technical reports sponsored by the Office of Environmental Management from its inception in 1989 through June 1994. Future issues contain reports from Technology Development activities and will be published biannually.

12 (DOE/RL-88-30-Rev.4-Vol.1) Hanford Site waste management units report. Revision 4, Volume 1. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). [1995]. 723p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009600. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site waste management units report (hereafter referred to simply as the "units report") was originated to provide information responsive to Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984. The units report provides a comprehensive inventory of all types of waste management units at the Hanford Site, including a description of the units and the waste they contain. Waste management units in the report include: Resource Conservation and Recovery Act of 1976 (RCRA) disposal units; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) disposal units; unplanned releases; inactive contaminated structures; RCRA treatment, storage, and disposal (TSD) units; and other storage areas. Because of the comprehensive nature of the units report, the list of units is more extensive than required by Section 3004(u) of Hazardous and Solid Waste Amendments of 1984. The information in this report is extracted from the Waste Information Data System (WIDS). The WIDS database provides additional information concerning the waste management units contained in this report and is maintained with current changes to these waste management units. This report is updated annually if determined necessary per the Hanford Federal Facility Agreement and Consent Order (commonly known as the Tri-Party Agreement).

13 (DOE/RL-88-30-Rev.4-Vol.2) Hanford Site waste management units report: Sample and data management. Revision 4, Volume 2. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland,

WA (United States). Jan 1955. 562p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009601. Source: OSTI; NTIS; GPO Dep.

The Hanford Site waste management units report (hereafter referred to simply as the "units report") was originated to provide information responsive to Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984. The units report provides a comprehensive inventory of all types of waste management units at the Hanford Site, including a description of the units and the waste they contain. Waste management units in the report include: Resource Conservation and Recovery Act of 1976 (RCRA) disposal units; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) disposal units; unplanned releases; inactive contaminated structures; RCRA treatment, storage, and disposal (TSD) units; and other storage areas. Because of the comprehensive nature of the units report, the list of units is more extensive than required by Section 3004(u) of Hazardous and Solid Waste Amendments of 1984. The information in this report is extracted from the Waste Information Data System (WIDS). The WIDS database provides additional information concerning the waste management units contained in this report and is maintained with current changes to these waste management units. This report is updated annually if determined necessary per the Hanford Federal Facility Agreement and Consent Order (commonly known as the Tri-Party Agreement).

14 (DOE/RL-90-21) Remedial Investigation/feasibility study work plan for the 100-KR-4 operable unit, Hanford Site, Richland, Washington. USDOE Richland Operations Office, WA (United States). Sep 1992. 404p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016324. Source: OSTI; NTIS; INIS; GPO Dep.

Four areas of the Hanford Site (the 100, 200, 300, and 1100 Areas) have been included on the US Environmental Protection Agency's (EPA's) National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). This work plan and the attached supporting project plans establish the operable unit setting and the objectives, procedures, tasks, and schedule for conducting the CERCLA remedial investigation/feasibility study (RI/FS) for the 100-KR-4 operable unit. The 100-K Area consists of the 100-KR-4 groundwater operable unit and three source operable units. The 100-KR-4 operable unit includes all contamination found in the aquifer soils and water beneath the 100-K Area. Source operable units include facilities and unplanned release sites that are potential sources of contamination.

15 (DOE/RL-94-46) Environmental Restoration Program technology baseline plan. Bechtel Hanford, Inc., Richland, WA (United States). Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95004949. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium production and purification processes at the Hanford Site generated and/or used numerous radioactive and hazardous substances, leaving behind a wide variety of hazardous, radioactive, and mixed wastes in the forms of contaminated soil, groundwater, buried waste, equipment, piping, and structures. Currently, there are at least 1,391 individual waste sites on the Hanford Site. Based on existing characterizations, 174 of the sites contain nonhazardous

waste, 134 contain hazardous waste, 133 contain radioactive waste, and 950 contain mixed wastes. These sites are being remediated, decontaminated, and decommissioned by activities within the Hanford Site Environmental Restoration (ER) Program. This document presents a baseline for the many technologies anticipated to perform and support various types of remedial actions. It also discusses a variety of remediation strategies that, in combination, pose a number of technical, economic, and regulatory constraints that affect the selection of individual remediation technologies.

16 (PNL-10400-Draft) Identification of contaminants of concern Columbia River Comprehensive Impact Assessment. Napier, B.A.; Batishko, N.C.; Heise-Craff, D.A.; Jarvis, M.F.; Snyder, S.F. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006489. Source: OSTI; NTIS; INIS; GPO Dep.

The Columbia River Comprehensive Impact Assessment (CRCIA) Project at the Pacific Northwest Laboratory (PNL) is evaluating the current human and ecological risks from contaminants in the Columbia River. The risks to be studied are those attributable to past and present activities on the Hanford Site. The Hanford Site is located in southcentral Washington State near the town of Richland. Human risk from exposure to radioactive and hazardous materials will be addressed for a range of river use options. Ecological risk will be evaluated relative to the health of the current river ecosystem. The overall purpose of the project is to determine if enough contamination exists in the Columbia River to warrant cleanup actions under applicable environmental regulations. This report documents an initial review, from a risk perspective, of the wealth of historical data concerning current or potential contamination in the Columbia River. Sampling data were examined for over 600 contaminants. A screening analysis was performed to identify those substances present in such quantities that they may pose a significant human or ecological risk. These substances will require a more detailed analysis to assess their impact on humans or the river ecosystem.

17 (WHC-EP-0549-Vol.1-2) Hanford Strategic Analysis Study. Volumes 1 and 2. Pajunen, A.L. (and others); Allen, G.K.; Carlson, A.B. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 205p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010946. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Strategic Analysis study presents comparisons of alternative cleanup strategies for the Hanford Site. Material balances, estimating the bulk flow and distribution of chemicals and radionuclides flowing through process blocks modeling disposition of the overall Site inventory, form the primary description of each alternative. Comparison parameters, such as overall life cycle costs, are then derived from the material balances. The purpose of Volume 2 of the Hanford Strategic Analysis (HSA) Study is to describe and discuss comparisons of integrated process options for achieving alternative cleanup strategies. The integrated systems described and compared in this volume rely on merging elements described in the other volumes of the HSA Study. Volume 3 presents a description of the methods developed to model material flows and estimate comparison parameters that are discussed in this volume. The cleanup strategies considered are based on the development in Volume 4. A description of the inventory information and the

alternative process elements available for material types disposition are also described in Volume 4. These elements are merged by the models described in Volume 3 to produce the integrated systems compared in this volume of the strategic analysis study. This report presents Volumes 1 and 2 of the Hanford Strategic Analysis.

18 (WHC-EP-0549-Vol.5) **Hanford Strategic Analysis Study. Volume 5, Appendixes.** Pajunen, A.L. (and others); Allen, G.K.; Carlson, A.B. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 1271p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010948. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Strategic Analysis study presents comparisons of alternative cleanup strategies for the Hanford Site. Material balances, estimating the bulk flow and distribution of chemicals and radionuclides flowing through process blocks modeling disposition of the overall Site inventory, form the primary description of each alternative. Comparison parameters, such as overall life cycle costs, are then derived from the material balances. The purpose of Volume 2 of the Hanford Strategic Analysis (HSA) Study is to describe and discuss comparisons of integrated process options for achieving alternative cleanup strategies. The integrated systems described and compared in this volume rely on merging elements described in the other volumes of the HSA Study. Volume 3 presents a description of the methods developed to model material flows and estimate comparison parameters that are discussed in this volume. The cleanup strategies considered are based on the development in Volume 4. A description of the inventory information and the alternative process elements available for material types disposition are also described in Volume 4. These elements are merged by the models described in Volume 3 to produce the integrated systems compared in this volume of the strategic analysis study. This report is Volume 5 of the Hanford Strategic Analysis, it is an Appendix to the document.

CONTAMINANT PLUME CONTAINMENT AND REMEDIATION

Refer also to citation(s) 17, 18, 428, 455, 924, 925, 926, 1713, 1746, 1764, 1765, 1769, 1770, 1771, 1772, 1773, 1780, 1781, 1782, 1784, 1785, 1786, 1787, 1788, 1789, 1790, 1792, 1793, 1796, 1797, 1798, 1799, 1804, 1814, 1816, 1820, 1822, 1854, 1880, 1881, 1882, 1892, 1893, 1894, 2098, 2334, 2380, 2405, 2430, 2439, 2593, 2595, 2897, 2928, 2979, 3015, 3021, 3041, 3042, 3075

19 (ANL-94/19) **ANL Technical Support Program for DOE Environmental Restoration and Waste Management: Annual report, October 1992-September 1993.** Bates, J.K. (and others); Bourcier, W.L.; Bradley, C.R. Argonne National Lab., IL (United States). Jun 1994. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94017954. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an overview of the progress during FY 1993 for the Technical Support Program that is part of the ANL Technology Support Activity for DOE Environmental Restoration and Waste Management (EM). The purpose is to evaluate, before hot start-up of the Defense Waste Processing Facility (DWPF) and the West Valley Demonstration Project (WVDP), factors that are anticipated to affect glass

reaction in an unsaturated environment typical of what may be expected for the candidate Yucca Mountain repository site. Specific goals for the testing program include the following: reviewing and evaluating available data on parameters that will be important in establishing the long-term performance of glass in a repository environment; performing tests to further quantify the effects of important variables where there are deficiencies in the available data; and initiating long-term tests to determine glass performance under a range of conditions applicable to repository disposal.

20 (ANL/CMT/CP-82030) **Cation segregation in simulated radioactive-waste zeolite-A mixtures.** Richardson, J.W. Jr. (Argonne National Lab., IL (United States)); Lewis, M.A.; McCart, B.R. Argonne National Lab., IL (United States). Jan 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940744-4: 10. international zeolite conference, Garmish-Partenkirchen (Germany), 17-22 Jul 1994). Order Number DE94014015. Source: OSTI; NTIS; INIS; GPO Dep.

Segregation of cations based on size is observed in samples of zeolite-A loaded with simulated radioactive-waste (~5 wt.% Li, K, Cs and Ba, 1 wt.% Sr and Y, <1 wt.% Na) prepared from chloride salts. In contrast to traditional Na zeolite-A, for which all 8-ring access super (α) cages are identical and situated on a simple face-centered-cubic lattice, these simulated rad-waste mixtures contain two types of α -cages situated on a NaCl-like lattice. The long range ordering of extra-framework ions is propagated by severe distortion of framework oxygens due to strong coordination with Li.

21 (ANL/CMT/CP-82133) **Applicability of slags as waste forms for hazardous waste.** Bates, J.K. (Argonne National Lab., IL (United States)); Buck, E.C.; Dietz, N.L.; Wronkiewicz, D.J.; Feng, X.; Whitworth, C.; Filius, K.; Battleson, D. Argonne National Lab., IL (United States); MSE, Inc., Butte, MT (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC22-88ID12735. (CONF-940815-63: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015030. Source: OSTI; NTIS; INIS; GPO Dep.

Slags, which are a combination of glassy and ceramic phases, were produced by the Component Development and Integration Facility, using a combination of soil and metal feeds. The slags were tested for durability using accelerated test methods in both water vapor and liquid water for time periods up to 179 days. The results indicated that under both conditions there was little reaction of the slag, in terms of material released to solution, or the reaction of the slag to form secondary mineral phases. The durability of the slags tested exceeded that of current high-level nuclear glass formulations and are viable materials, for waste disposal.

22 (ANL/DIS/CP-83606) **A hyperspectral image data exploration workbench for environmental science applications.** Woyna, M.A.; Christiansen, J.H.; Zawada, D.G.; Simunich, K.L. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9408129-2: DOD database colloquium '94, San Diego, CA (United States), 29-31 Aug 1994). Order Number DE94016373. Source: OSTI; NTIS; INIS; GPO Dep.

The Hyperspectral Image Data Exploration Workbench (HIDEW) software system has been developed by Argonne

National Laboratory to enable analysts at Unix workstations to conveniently access and manipulate high-resolution imagery data for analysis, mapping purposes, and input to environmental modeling applications. HIDEW is fully object-oriented, including the underlying database. This system was developed as an aid to site characterization work and atmospheric research projects.

23 (ANL/ESD/TM-73) Demonstration and evaluation of the pulsed ultraviolet-irradiation gas-treatment system, Savannah River Site. Schneider, J. (Argonne National Lab., IL (United States). Energy Systems Div.); Wilkey, M.; Peters, R.; Tomczyk, N.; Friedlund, J.; Farber, P.; Mass, B.; Haag, W. Argonne National Lab., IL (United States). Energy Systems Div. Oct 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95004813. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory was asked to demonstrate and evaluate a pulsed ultraviolet-irradiation system developed by Purus, Inc., at the Volatile Organic Compounds Non-Arid Integrated Demonstration at the Savannah River Site near Aiken, South Carolina. The Purus system consists of four reactor chambers, each containing a xenon flash lamp. During the two weeks of testing, samples were taken and analyzed from the inlet and outlet sides of the Purus system. The contaminants of concern on the inlet were tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA); the contaminants of concern on the outlet were PCE, TCE, TCA, carbon tetrachloride (CT), and chloroform. The evaluation of the Purus system included an examination of the reduction of both TCE and PCE and a search for any change in the concentrations. (Operating conditions included flow rates, ranging from 25 to 100 standard cubic feet per minute; inlet concentration of PCE, ranging from 360 to 10,700 parts per million volume; and flash lamp rates, ranging from 1 to 30 hertz.) The Purus system was quite efficient at reducing the concentrations of both PCE and TCE. The potential by-products, TCA, CT, and chloroform, showed no significant increases throughout the range of the various operating parameters. Overall, the Purus system appears to be a cost-efficient means of reducing the concentrations of PCE and TCE, while the removal of the initial photo-oxidation products and TCA is slower and needs further evaluation.

24 Modelling of hydro-thermo-mechanical effects in a fracture intersecting a nuclear waste deposition hole. Rutqvist, J. (Lulea Univ. of Technology (Sweden)); Stephansson, O.; Noorishad, J.; Tsang, C.F. pp. 547-554 of High Level Radioactive Waste Management: Proceedings of the second annual international conference: Proceedings, Volume 1. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 891 From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

The groundwater flow in a vertical fracture intersecting a hypothetical nuclear waste deposition hole was examined. After excavation and emplacement of the nuclear waste canister, the aperture of the radial fracture decreased close to the deposition hole. After swelling of the compacted bentonite buffer and when the rock mass has cooled to virgin temperature, the fracture aperture increased adjacent to the deposition hole wall. This causes a fluid flow velocity increase up to more than one order of magnitude adjacent to the deposition hole wall. The far field flow rate through the

repository is slightly affected by the swelling of the bentonite buffer.

25 Disposal of vitrified waste in an unsaturated environment. Bates, J.K. (Argonne National Lab., IL (United States)). pp. 700-707 of High Level Radioactive Waste Management: Proceedings of the second annual international conference: Proceedings, Volume 1. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 891 DOE Contract W-31109-ENG-38. From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

An experimental program is described wherein the effect of important independent variables on glass reaction under conditions that may exist for unsaturated storage is examined. The effect of radioactive vs. simulated glasses is being examined in a set of simple and integrated tests. Results through 140 days show that no major differences exist between the two glass types although some trends are being established that need further examination. The effect of SA/V was examined in preliminary tests done at 10, 50, and 100 m⁻¹. Analysis of the reacted glass structure indicated that as the SA/V changed, the assemblage of crystalline phases that formed on the reacted glass varied and the process by which the glass structure reacted changed. Finally, the effect of radiation on glass reactivity is being studied. For each variable studied, tests are in progress that will provide information to support startup of the glass processing facilities and licensing of a repository.

26 Mechanistic interpretation of glass reaction: Input to kinetic model development. Bates, J.K. (Argonne National Lab., IL (United States)); Ebert, W.L.; Bradley, J.P.; Bourcier, W.L. pp. 720-727 of High Level Radioactive Waste Management: Proceedings of the second annual international conference: Proceedings, Volume 1. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 891 DOE Contract W-31109-ENG-38. From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

Actinide-doped SRL 165 type glass was reacted in J-13 groundwater at 90°C for times up to 278 days. The reaction was characterized by both solution and solid analyses. The glass was seen to react nonstoichiometrically with preferred leaching of alkali metals and boron. High resolution electron microscopy revealed the formation of a complex layer structure which became separated from the underlying glass as the reaction progressed. The formation of the layer and its effect on continued glass reaction are discussed with respect to the current model for glass reaction used in the EQ3/6 computer simulation. It is concluded that the layer formed after 278 days is not protective and may eventually become fractured and generate particulates that may be transported by liquid water.

27 Boundary integral methods for unsaturated flow. Martinez, M.J. (Sandia National Labs., Albuquerque, NM (United States)); McTigue, D.F. pp. 830-836 of High Level Radioactive Waste Management: Proceedings of the second annual international conference: Proceedings, Volume 1. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 891 DOE Contract AC04-76DP00789. From 2. annual American Nuclear Society

(ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

A boundary integral equation method (BIEM) is described for numerical analysis of quasilinear steady unsaturated flow in homogeneous material. The applicability of the exponential model for the dependence of hydraulic conductivity on pressure head is discussed briefly. This constitutive assumption is at the heart of the quasilinear transformation. Materials which display a wide distribution in pore-size are described reasonably well by the exponential. For materials with a narrow range in pore-size, the exponential is suitable over more limited ranges in pressure head. The numerical implementation of the BIEM is used to investigate the infiltration from a strip source to a water table. The net infiltration of moisture into a finite-depth layer is well-described by results for a semi-infinite layer if $\alpha D > 4$, where α is the sorptive number and D is the depth to the water table. The distribution of moisture exhibits a similar dependence on αD .

28 Speciation of uranium(VI) sorption complexes on montmorillonite. Chisholm-Brause, C.J. (Los Alamos National Lab., NM (United States)); Morris, D.E.; Richard, R.E. pp. 137-140 of *Water-Rock Interaction: Proceedings: Volume 1, Low temperature environments*. Kharaka, Y.K.; Maest, A.S. (eds.). A.A. Balkema, Rotterdam (Netherlands) (1992). pp. 884 From 7. water-rock interaction conference; Park City, UT (United States); 9-23 Jul 1992.

We have investigated the effect of changes in solution speciation on the nature of uranyl sorption complexes on montmorillonite at different surface coverages (342 to 13042 ppm). Aqueous U(VI) solutions between pH 3 to 7 were batch-equilibrated with montmorillonite for several days; specific pH values were selected such that the solution consisted of dominantly monomeric, oligomeric, or a mix of monomeric and oligomeric aqueous uranyl species. Emission spectroscopy was used to investigate the nature of U(VI) sorbed to montmorillonite. Several surface complexes have been identified. The distribution of these complexes changes markedly as a function of surface coverages at moderate uranyl loadings (8230 to 13042 ppm), but a single species dominates at lower coverages (342 to 476 ppm). A distinct set of sorption species form over a wide range of pH values at low to moderate coverages. Furthermore, there are only subtle differences in the nature of sorption complexes formed at different pH values but similar coverages despite markedly different uranyl speciation in solution. These results suggest that the speciation of the solution has minimal influence on the nature of the sorption complex under these experimental conditions. 3 refs., 6 figs.

29 Oxalate complexation with aluminum(III) and iron(III) at moderately elevated temperatures. Tait, C.D. (Los Alamos National Lab., NM (United States)); Janecky, D.R.; Clark, D.L.; Bennett, P.C. pp. 349-352 of *Water-Rock Interaction: Proceedings: Volume 1, Low temperature environments*. Kharaka, Y.K.; Maest, A.S. (eds.). A.A. Balkema, Rotterdam (Netherlands) (1992). pp. 884 DOE Contract W-7405-ENG-36. From 7. water-rock interaction conference; Park City, UT (United States); 9-23 Jul 1992.

To add to our understanding of the weathering of rocks in organic rich environments such as sedimentary brines and oil field waters, we have examined the temperature dependent complexation of aluminum with oxalate. Raman vibrational studies show that even the association constant for the highly charged $\text{Al}(\text{ox})_3^{3-}$ unexpectedly increases with moderate temperature increases to 80°C. To evaluate the

potential importance of these Al-oxalate species in complex natural systems, temperature dependent competition experiments between Fe(III) and Al(III) for oxalate have been initiated. Similar to aluminum, ferric oxalates show increases in association constants at higher temperatures. In competition experiments, the first associations constant for $\text{Fe}(\text{ox})^+$ increases faster than that for $\text{Al}(\text{ox})^+$ to 90°C. 18 refs., 5 figs.

30 Water infiltration rates in the unsaturated zone at the Idaho National Engineering Laboratory estimated from chlorine-36 and tritium profiles, and neutron logging. Cecil, L.D. (Geological Survey, Idaho Falls (United States)); Pittman, J.R.; Beasley, T.M.; Michel, R.L.; Kubik, P.W.; Sharma, P.; Fehn, U.; Gove, H.E. pp. 709-714 of *Water-Rock Interaction: Proceedings: Volume 1, Low temperature environments*. Kharaka, Y.K.; Maest, A.S. (eds.). A.A. Balkema, Rotterdam (Netherlands) (1992). pp. 884 From 7. water-rock interaction conference; Park City, UT (United States); 9-23 Jul 1992.

Environmental tracers (chlorine-36 and tritium) were used at the Radioactive Waste Management Complex (RWMC) to estimate natural water infiltration rates in the unsaturated zone near buried nuclear waste. Chlorine-36 and tritium were measured in the soil column to determine the depth of the maximum concentration of these radionuclides produced by atmospheric testing of nuclear devices in the late 1950's and 1960's. Historically, the nuclear fuel reprocessing operations at the Idaho Chemical Processing Plant also have contributed to the atmospheric deposition of these radionuclides at the Idaho National Engineering Laboratory. Soil cores for analysis of chlorine-36 and tritium were taken from undisturbed soil near subsurface instrumentation (thermocouple psychrometers, tensiometers, and a neutron moisture gage) that has been used since 1985 to establish the vertical hydraulic head distribution in the unsaturated zone. The neutron-probe access hole used is in an undisturbed soil profile adjacent to the RWM. Rates calculated from the profiles of the environmental tracers and from the neutron-logging indicate that site-specific net infiltration to the unsaturated zone ranges from 0.36 to 1.1 cm/year. This represents 2 to 5 percent of average annual precipitation. 20 refs., 2 figs., 1 tab.

31 (CONF-9302191-1) Hydrogen peroxide treatment of TCE contaminated soil. Hurst, D.H. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Civil Engineering); Robinson, K.G.; Siegrist, R.L. Oak Ridge National Lab., TN (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. international conference on chemical oxidation; Nashville, TN (United States); 17-19 Feb 1993. Order Number DE94018707. Source: OSTI; NTIS; INIS; GPO Dep.

Solvent contaminated soils are ubiquitous in the industrial world and represent a significant environmental hazard due to their persistence and potentially negative impacts on human health and the environment. Environmental regulations favor treatment of soils with options which reduce the volume and toxicity of contaminants in place. One such treatment option is the in-situ application of hydrogen peroxide to soils contaminated with chlorinated solvents such as trichloroethylene (TCE). This study investigated hydrogen peroxide mass loading rates on removal of TCE from soils of varying organic matter content. Batch experiments conducted on contaminated loam samples using GC headspace analysis showed up to 80% TCE removal upon peroxide

treatment. Column experiments conducted on sandy loam soils with high organic matter content showed only 25% TCE removal, even at hydrogen peroxide additions of 25 g peroxide per kg soil.

32 Surface complexation model prediction of Np and Pu distribution coefficients. Mariner, P.E. (INTERA, Inc., Austin, TX (United States)); Jackson, R.E. pp. 1539-1546 of *High Level Radioactive Waste Management: Proceedings: Volume 2*. American Nuclear Society, Inc., La Grange Park, IL (United States) (1993). pp. 1090 From 10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993.

Robust estimates of radionuclide sorption coefficients (K_d) are needed to estimate radionuclide retardation during ground-water transport from a radioactive waste repository to the biosphere. It is demonstrated that surface complexation modeling (SCM) can provide not only a sensitive analysis of the critical variables affecting radionuclide transport in granitic rocks but also develop geochemically robust K_d data bases for systems models. In addition, this paper contains (1) the determination and development of a chemical reaction data base for Pu and Np aqueous and adsorbed species, (2) a sensitivity analysis of Pu and Np sorption over realistic ranges of pH, p_e , specific surface area and the concentration of radionuclides and aqueous and adsorbed organic matter, and (3) an assessment of the effects of variations in these variables on Pu and Np K_d values.

33 (CONF-930873-, pp. 9.3.1-9.3.6) Co-disposal of mixed waste materials. Phillips, S.J. (Westinghouse Hanford Co., Richland, WA (United States)); Alexander, R.G.; Crane, P.J.; England, J.L.; Kemp, C.J.; Stewart, W.E. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Co-disposal of process waste streams with hazardous and radioactive materials in landfills results in large, use-efficiencies waste minimization and considerable cost savings. Wasterock, produced from nuclear and chemical process waste streams, is segregated, treated, tested to ensure regulatory compliance, and then is placed in mixed waste landfills, burial trenches, or existing environmental restoration sites. Large geotechnical unit operations are used to pretreat, stabilize, transport, and emplace wasterock into landfill or equivalent subsurface structures. Prototype system components currently are being developed for demonstration of co-disposal.

34 Waste glass weathering. Bates, J.K. (Argonne National Lab., IL (United States)); Buck, E.C. pp. 41-53 of *Scientific basis for nuclear waste management XVII*. Barkatt, A. (ed.); Van Konyneburg, R.A. (ed.). Materials Research Society, Pittsburgh, PA (United States) (1994). pp. 964 DOE Contract W-31109-ENG-38. From Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 29 Nov - 3 dec 1993.

The weathering of glass is reviewed by examining processes that affect the reaction of commercial, historical, natural, and nuclear waste glass under conditions of contact with humid air and slowly dripping water, which may lead to immersion in nearly static solution. Radionuclide release data from weathered glass under conditions that may exist

in an unsaturated environment are presented and compared to release under standard leaching conditions. While the comparison between the release under weathering and leaching conditions is not exact, due to variability of reaction in humid air, evidence is presented of radionuclide release under a variety of conditions. These results suggest that both the amount and form of radionuclide release can be affected by the weathering of glass.

35 (CONF-931113-1) Vapor phase VOC transport in physically-mixed clay soils. Carpenter, M.D. (Michigan Technological Univ., Houghton, MI (United States). Dept. of Geological Engineering, Geology, and Geophysics); Gierke, J.S.; Siegrist, R.L.; West, O.R. Oak Ridge National Lab., TN (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on petroleum hydrocarbons and organic chemicals in ground water: prevention, detection and restoration; Houston, TX (United States); 10-12 Nov 1993. Order Number DE94018702. Source: OSTI; NTIS; GPO Dep.

Experiments were conducted to provide insight into the controlling removal mechanisms for a mixed region vapor stripping process in clay soils. Results of soil column experiments were compared to a mathematical model to determine intra-aggregate diffusion coefficients and sorption coefficients at different temperatures. Under the assumption that intra-aggregate diffusion was the rate limiting removal mechanism, the mathematical model predicted the removal of trichloroethylene at 20°C, 40°C, and 60°C. Agreement between the experimental observations and the model were very good. Faster removal of TCE was observed with increasing temperature.

36 (CONF-931119-4) In-situ stabilization of mixed waste contaminated soil. Siegrist, R.L. (Oak Ridge National Lab., TN (United States)); Cline, S.R.; Gilliam, T.M.; Conner, J.R. Oak Ridge National Lab., TN (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. international symposium on stabilization/solidification of hazardous, radioactive and mixed wastes; Williamsburg, VA (United States); 1-5 Nov 1993. Order Number DE94018037. Source: OSTI; NTIS; INIS; GPO Dep.

A full-scale field demonstration was conducted to evaluate in for stabilizing an inactive RCRA land treatment site at a DOE facility in Ohio. Subsurface silt and clay deposits were contaminated principally with up to 500 mg/kg of trichloroethylene and other halocarbons, but also trace to low levels of Pb, Cr, ^{235}U , and ^{99}Tc . In situ solidification was studied in three, 3.1 m diameter by 4.6 m deep columns. During mixing, a cement-based grout was injected and any missions from the mixed region were captured in a shroud and treated by filtration and carbon adsorption. During in situ processing, operation and performance parameters were measured, and soil cores were obtained from a solidified column 15 months later. Despite previous site-specific treatability experience, there were difficulties in selecting a grout with the requisite treatment agents amenable to subsurface injection and at a volume adequate for distribution throughout the mixed region while minimizing volume expansion. observations during the demonstration revealed that in situ solidification was rapidly accomplished (e.g., >90 m³/d) with limited emissions of volatile organics (i.e., < 1 wt. % of initial Soil VOCs). Grout distribution within the mixed region was not uniform, with marked differences in compressive

strength and elemental content with depth. Volume expansion was significant (30% v/v) and the hydraulic conductivity of the solidified soil was greater than that of the undisturbed natural deposit (10^{-6} cm/s vs. 10^{-8} cm/s). Leaching tests performed on the treated samples revealed non-detectable to acceptably low concentrations of all target contaminants.

37 The effect of fuel type in unsaturated spent fuel tests. Finn, P.A. (Argonne National Lab., IL (United States)); Gong, M.; Bates, J.K.; Emery, J.W.; Hoh, J.C. pp. 1080-1087 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 DOE Contract W-31109-ENG-38. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

Two well-characterized types of spent nuclear fuel (ATM-103 and ATM-106) were tested under simulated unsaturated conditions with simulated groundwater at 90°C. The actinides present in the leachate were measured after periods of approximately 60, 120, and 275 days. The vessels were acid stripped after 120 and 275 days. Both colloidal and soluble actinide species were detected in the leachates which had pHs ranging from 4 to 7. Alpha spectroscopy studies of filtered and unfiltered leachates showed that large amounts of actinides may be bound in colloids. The uranium phases identified in the colloids were schoepite and soddyite. The actinide release behavior of the two fuels appears to be different. The ATM-106 fuel began to release actinides later than the ATM-103 fuel, but after 275 days, it had released more. The amount of americium released from the two fuels was a higher percentage of the maximum amount of americium present than was the percentage of the simultaneous amount of uranium released.

38 Results of drip tests on sludge-based and actinide-doped glasses. Bates, J.K. (Argonne National Lab., IL (United States)); Buck, E.C. pp. 1088-1101 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 DOE Contract W-31109-ENG-38. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

The reaction of three different types of simulated nuclear waste glasses is being evaluated using a test method that slowly drips water onto a glass/metal assembly. The tests have been in progress for up to eight years and are being performed with as-cast and glass aged by reaction with water vapor. Results are presented for the cumulative release of Np, Pu, and Am as a function of time; also reported are the particulate species that have been detected suspended in solution. A significant difference is noted in the suspended species depending on the glass composition, and on whether the glass is aged. With as-cast glass, the radioactivity is associated with the suspended particles, while with the aged glass, the solution has a high initial anion content, and the transuranic elements appear to be dissolved in solution, since they pass through filters with small pore sizes. Examples are given of possible tests to evaluate the interaction between these test solutions and potential engineered barrier components.

39 (CONF-9405167-1) Triple sorbent thermal desorption/gas chromatography/mass spectrometry determination of vapor phase organic contaminants. Ma,

C.Y.; Skeen, J.T.; Dindal, A.B.; Higgins, C.E.; Jenkins, R.A. Oak Ridge National Lab., TN (United States). May 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Measurement of toxic and related air pollutants; Durham, NC (United States); 3-6 May 1994. Order Number DE94013634. Source: OSTI; NTIS; INIS; GPO Dep.

A thermal desorption/ps chromatography/mass spectrometry (TD/GC/MS) has been evaluated for the determination of volatile organic compounds (VOCs) in vapor phase samples using Carbosieve S-III/Carbotrap/Carotrap C triple sorbent traps (TST) similar to those available from a commercial source. The analysis was carried out with a Hewlett-Packard 5985A or 5995 GC/MS system with a modified injector to adapt an inhouse manufactured short-path desorber for transferring desorbate directly onto a cryofocusing loop for subsequent GC/MS analysis. Vapor phase standards generated from twenty six compounds were used for method validation, including alkanes, alkyl alcohols, alkyl ketones, and alkyl nitrites, a group of representative compounds that have previously been identified in a target airborne matrix. The method was validated based on the satisfactory results in terms of reproducibility, recovery rate, stability, and linearity. A relative, standard deviation of 0.55 to 24.3 % was obtained for the entire TD process (generation of gas phase standards, spiking the standards on and desorbing from TST) over a concentration range of 20 to 500 ng/trap. Linear correlation coefficients for the calibration curves as determined ranged from 0.81 to 0.99 and limits of detection ranged from 3 to 76 ng. For a majority of standards, recoveries of greater than 90% were observed. For three selected standards spiked on TSTs, minimal loss (10 to 22%) was observed after storing the spiked in, a 4°C refrigerator for 29 days. The only chromatographable artifact observed was a 5% conversion of isopropanol to acetone. The validated method been successfully applied, to the determination of VOCs collected from various emission sources in a diversified concentration range.

40 (CONF-940789-1) In situ treatment of VOCs by recirculation technologies. Webb, O.F. (Oak Ridge National Lab., TN (United States)); Siegrist, R.L.; Ally, M.R.; Sanford, W.E.; Kearn, P.M.; Zutman, J.L. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Society of Civil Engineers 1994 National Council on Environmental Engineering (NCEE) conference on critical issues in water and waste water treatment; Boulder, CO (United States); 11-13 Jul 1994. Order Number DE94013263. Source: OSTI; NTIS; GPO Dep.

Confronted with contaminated land from the world wars and the postwar industrialization period, German researchers and practicing professionals have worked to develop processes for effective environmental restoration. This presentation documents efforts by Oak Ridge National Laboratory (ORNL) researchers to (1) identify collaborators and German technologies exhibiting near-term potential for clean-up of volatile organic contaminated soil and groundwater at Department of Energy sites, (2) critically assess performance, and (3) inform interested agencies. The project was limited to identification and preliminary evaluation and included engineering computations, groundwater flow modeling, and treatment process modeling. Two processes were identified: (1) the vacuum vaporizer well/groundwater recirculation well and (2) the porous pipe/horizontal well (PP/HW). Both technologies induce a recirculation flow field in the aquifer and enable simultaneous down

hole treatment of the aquifer and vadose zone. University of Karlsruhe researchers have demonstrated the UVB/GZB technology in shallow aquifers with moderately high saturated thickness and hydraulic conductivities. The PP/HW technology offers potential for VOC treatment in sites with thin aquifers or heterogeneities. This paper describes identified German technologies and includes critical evaluations of well performance, associated treatment processes, operating variables, and aquifer-well interactions.

41 (CONF-9408110-1) Groundwater modeling of source terms and contaminant plumes for DOE low-level waste performance assessments. McDowell-Boyer, L.M.; Wilson, J.E. Oak Ridge National Lab., Grand Junction, CO (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 groundwater modeling conference; Fort Collins, CO (United States); 10-13 Aug 1994. Order Number DE94014019. Source: OSTI; NTIS; INIS; GPO Dep.

Under US Department of Energy (DOE) Order 5820.2A, all sites within the DOE complex must analyze the performance of planned radioactive waste disposal facilities before disposal takes place through the radiological performance assessment process. These assessments consider both exposures to the public from radionuclides potentially released from disposal facilities and protection of groundwater resources. Compliance with requirements for groundwater protection is often the most difficult to demonstrate as these requirements are generally more restrictive than those for other pathways. Modeling of subsurface unsaturated and saturated flow and transport was conducted for two such assessments for the Savannah River site. The computer code PORFLOW was used to evaluate release and transport of radionuclides from different types of disposal unit configurations: vault disposal and trench disposal. The effectiveness of engineered barriers was evaluated in terms of compliance with groundwater protection requirements. The findings suggest that, due to the limited lifetime of engineered barriers, overdesign of facilities for long-lived radionuclides is likely to occur if compliance must be realized for thousands of years.

42 (CONF-9411138-1) Comparison of methods for developing contaminant-particle size distributions for suspended sediment. Moore, T.D. (Univ. of Tennessee, Knoxville, TN (United States)); Burgoa, B.B.; Fontaine, T.A. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 30. American Water Resources Association (AWRA) annual conference on water quality; Chicago, IL (United States); 6-10 Nov 1994. Order Number DE95001349. Source: OSTI; NTIS; INIS; GPO Dep.

Relationships between contaminant concentration and particle size distribution are required for modeling the transport of contaminated sediment. Standard methods, including the pipette and bottom withdrawal techniques, are unsatisfactory because of the lack of homogeneous separations of each size fraction, which results in uncertainty in the contaminant-particle size relation. In addition, the size fractions produced with these techniques do not contain enough mass for accurate contaminant analyses. To avoid these problems, an alternative method using a settling column and withdrawal times based on Stokes Law has been developed. Tests have been conducted using sediment samples contaminated with Cs-137 from a waste area at Oak Ridge National Laboratory. The samples were separated into sand, coarse and fine silt, and clay-sized particles. The results for

particle size distribution and associated contaminant concentrations were evaluated for the settling column, pipette, and bottom withdrawal methods. The settling column method provides homogeneous size fractions, larger aliquots of sediment for contaminant analysis, and is quicker in some cases and less complicated to perform than the other two methods.

43 (CONF-941245-2) Sequential anaerobic-aerobic degradation of indigenous PCBs in a contaminated soil matrix. Klasson, K.T. (Oak Ridge National Lab., TN (United States). Chemical Technology Div.); Reeves, M.E.; Evans, B.S.; Dudley, C.A. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From IGT symposium on gas, oil, and environmental biotechnology; Colorado Springs, CO (United States); 12-14 Dec 1994. Order Number DE95008678. Source: OSTI; NTIS; GPO Dep.

Many industrial locations, including the US Department of Energy's, have identified needs for treatment of polychlorinated biphenyl (PCB) wastes and remediation of PCB-contaminated sites. Biodegradation of PCBs is a potentially effective technology for the treatment of PCB-contaminated soils and sludges; however, a practicable remediation technology has not yet been demonstrated. A biological treatment technology is likely to consist of an anaerobic fermentation step in which PCB dechlorination takes place producing PCBs with fewer chlorines. These products are then more susceptible to aerobic mineralization. In laboratory experiments, soil slurry bioreactors inoculated with microorganisms extracted from PCB-contaminated sediments from the Hudson River and Woods Pond have been used to obtain anaerobic dechlorination of PCBs in soil slurry reactors. The anaerobic dechlorination was followed by qualitative estimation of the effect of aerobic fermentation of the dechlorination products based on literature data. The sequential anaerobic-(simulated) aerobic treatment constituted an improvement compared anaerobic treatment alone.

44 (CONF-950209-5) Evaluation of immunoassay-based field test kits for the detection of petroleum fuel hydrocarbons in soil. Waters, L.C.; Palausky, M.A.; Counts, R.W.; Jenkins, R.A. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995. Order Number DE95009696. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to identify, experimentally evaluate and implement the use of alternative field screening methods that are specific for environmental contaminants of interest and concern to the Department of Energy. Immunochemical techniques are rapidly becoming a significant component in the arsenal of field screening methods. Analytical results obtained by immunoassay have been shown to correlate well with those obtained by traditional laboratory methods. Also, the use of immunoassay-based field screening methods can significantly reduce the cost and time required for environmental assessment. The authors are currently evaluating the effectiveness of several immunoassay-based test kits for detecting petroleum fuel hydrocarbons in soil. Evaluations of two kits, one a semi-quantitative assay and the other a quantitative assay, have been completed. The samples analyzed were either solvent

or soil spiked with either a mixture of benzene, toluene, ethylbenzene and the three isomers of xylene (BTEX), or gasoline. The kits performed well and according to the manufacturers' claims. Of the 50 assays made with the semiquantitative test, the concentrations of 44 samples were correctly determined. The other six samples were determined to be false positives. A soil matrix effect was observed that could account for some of the false positive results. Experimental results using the quantitative test with BTEX (68 assays) correlated well with those expected; R^2 of 0.976 to 0.983 with slopes of 0.94 to 0.97. With gasoline (38 assays) R^2 values of 0.957 to 0.987 and slopes of 0.76 to 0.78 were obtained. The lower slopes with gasoline are indicative of the lower immunoreactivity of that particular sample of gasoline relative to BTEX.

45 (CONF-950209-6) **Adapting the Bruel and Kjaer Multi-gas Monitor Type 1302 to measure selected volatile organic chemicals (VOCs) in soil.** Palausky, M.A.; Waters, L.C.; Counts, R.W.; Jenkins, R.A. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995. Order Number DE95009697. Source: OSTI; NTIS; GPO Dep.

The Bruel and Kjaer Multi-gas Monitor Type 1302 can simultaneously measure up to five different volatile organic chemicals (VOCs) in a single air sample by using optical filters combined with a photo acoustic detection method. The monitor has previously been validated to measure VOCs in water, by purging aqueous samples into Tedlar™ bags. The method used to measure VOCs in water has been adapted for use with soil. Soil samples are diluted with water and VOCs are purged with air from the resulting slurry into a Tedlar™ bag. The contents of the Tedlar™ bag are then analyzed with the multi-gas monitor. Data have been generated for the measurement of chloroform, trichloroethylene, tetrachloroethylene, carbon tetrachloride, and acetone. The method is linear for these VOCs from approximately 1 to at least 128 $\mu\text{g/g}$ of soil (ppM). There is no measurable cross interference of these VOCs with each other when more than one is present in a single soil sample. Contaminants other than those being measured may interfere with detection of these VOCs, so some prior site characterization is required. The method is easy to perform, rapid, reproducible, and sensitive enough for field screening applications.

46 (CONF-950216-129) **Bench- and pilot-scale demonstration of thermal desorption for removal of mercury from the Lower East Fork Poplar Creek floodplain soils.** Morris, M.I. (Oak Ridge National Lab., TN (United States)); Sams, R.J.; Gillis, G.; Helsel, R.W.; Alperin, E.S.; Geisler, T.J.; Groen, A.; Root, D. Oak Ridge National Lab., TN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 Mar 1995. Order Number DE95009693. Source: OSTI; NTIS; INIS; GPO Dep.

Thermal desorption is an innovative technology that has seen significant growth in applications to organically contaminated soils and sludges for the remediation of hazardous, radioactive and mixed waste sites. This paper will present the results of a bench and pilot-scale demonstration of this technology for the removal of mercury from the Lower East Fork Poplar Creek floodplain soil. Results demonstrate that the mercury in this soil can be successfully removed to

the target treatment levels of 10 milligrams per kilogram (mg/kg) and that all process residuals could be rendered RCRA-nonhazardous as defined by the Resource Conservation and Recovery Act. Sampling and analyses of the desorber off-gas before and after the air pollution control system demonstrated effective collection of mercury and organic constituents. Pilot-scale testing was also conducted to verify requirements for material handling of soil into and out of the process. This paper will also present a conceptual design and preliminary costs of a full-scale system, including feed preparation, thermal treatment, and residuals handling for the soil.

47 (CONF-9503120-1) **Radionuclide containment in soil by phosphate treatment.** Lee, S.Y. (Oak Ridge National Lab., TN (United States)); Francis, C.W.; Timpson, M.E.; Elless, M.P. Oak Ridge National Lab., TN (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States); Korea Inst. of Nuclear Safety, Taejeon (Korea, Republic of). DOE Contract AC05-84OR21400. From Instructions for the Hazardous Materials Resources Institute conference; Atlanta, GA (United States); 14-15 Mar 1995. Order Number DE95009026. Source: OSTI; NTIS; INIS; GPO Dep.

Radionuclide transport from a contaminant source to groundwater and surface water is a common problem faced by most US Department of Energy (DOE) facilities. Containment of the radionuclide plume, including strontium-90 and uranium, is possible using phosphate treatment as a chemical stabilizer. Such a chemical process occurs in soils under natural environmental conditions. Therefore, the concept of phosphate amendment for radiostromium and uranium immobilization is already a proven principle. In this presentation, results of bench-scale experiments and the concept of a field-scale demonstration are discussed. The phosphate treatment is possible at the source or near the advancing contaminant plume. Cleanup is still the ideal concept; however, containment through stabilization is a more practical and cost-effective concept that should be examined by DOE Environmental Restoration programs.

48 (CONF-950483-2) **Method efficiency and signal quantification of bacteria for a groundwater transport experiment.** Burlage, R.S.; Palumbo, A.V.; McCarthy, J. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. international symposium on in situ and on-site bioreclamation; San Diego, CA (United States); 24-27 Apr 1995. Order Number DE95010296. Source: OSTI; NTIS; GPO Dep.

Bacterial transport is a key process in delivery of microbes to contaminated sites for bioremediation of chemicals. However, relatively little is known about the geochemical and hydrologic factors controlling the mobility of bacteria and viruses within subsurface systems. Laboratory-scale column studies have provided useful information (Harvey et al, 1989, 1993). However, successful application to in situ remediation will require that one identify and understand properties relevant to transport in aquifers. Only through field experiments can one evaluate the scales of physical and chemical heterogeneity in natural aquifers that affect the transport of microbiota in ways not predicted from experiments conducted at the laboratory-scale. Bacterial transport field experiments cannot be replicated as can column experiments. Rigorous testing of experimental hypotheses will require comparisons of the mobility of multiple strains with contrasting transport properties under identical

field conditions. Consequently, a technique is needed to permit the transport of multiple strains of bacteria to be monitored simultaneously in a single field experiment. Molecular techniques can also detect very low levels of injected bacteria. Polymerase chain reaction (PCR) has been used successfully for the detection of microorganisms. This paper explores the use of PCR for identifying and enumerating the arrival of several individual strains of bacteria at monitoring wells downgradient of an experimental tracer injection well.

49 (DOE/CH/10618-T1) Description of the U.S. Geological Survey's slug-tests at the Hallam Nuclear Facility, July to November 1994. Geological Survey, Lincoln, NE (United States). Water Resources Div. 19 Jan 1995. 16p. Sponsored by USDOE, Washington, DC (United States); Department of the Interior, Washington, DC (United States). DOE Contract AI02-94CH10618. Order Number DE95008725. Source: OSTI; NTIS; INIS; GPO Dep.

An aquifer test agreement between the US Department of Energy (USDOE) and the US Geological Survey (USGS) was set up to log and measure the aquifer response in two observation wells, 1B and 4C at the Hallam Nuclear Facility, Hallam, Nebraska. Observation wells 1B and 4C are owned by the USDOE and were installed by HWS Technologies Inc. of Lincoln, Nebraska, in June 1993. These observation wells were measured monthly from September 1993 to August 1994 by using a graduated steel tape. The accuracy of these water-level measurements is approximately ± 0.02 foot. Also well 1B contained a submersible pressure transducer to record hourly water-level data during this same period. During access of the wells, personnel wear clean disposable latex gloves, a hard hat, and safety glasses. Directly following each measurement the steel-tape was rinsed with deionized water and the effluent was disposed of in a 55-gallon drum. For the aquifer tests, observation wells 1B and 4C had submersible pressure transducers installed to monitor water-level responses. These pressure transducers were connected to an electronic data logger (edl) to record the water levels, atmospheric pressure from a barometric pressure gauge, and rainfall data from a tipping-bucket rain gauge. The data recorded on each edl was downloaded onto a field computer during each site visit, processed in the field, and then stored on the USGS's Data General workstations upon return to the District Office.

50 (DOE/EM-0201) In Situ Remediation Integrated Program: Evaluation and assessment of containment technology. Gerber, M.A.; Fayer, M.J. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003293. Source: OSTI; NTIS; INIS; GPO Dep.

Containment technology refers to a broad range of methods that are used to contain waste or contaminated groundwater and to keep uncontaminated water from entering a waste site. The U.S. Department of Energy's (DOE) Office of Technology Development has instituted the In Situ Remediation Integrated Program (ISRIP) to advance the state-of-the-art of innovative technologies that contain or treat, in situ, contaminated media such as soil and groundwater, to the point of demonstration and to broaden the applicability of these technologies to the widely varying site remediation requirements throughout the DOE complex. The information provided here is an overview of the state-of-the-art of containment technology and includes a discussion of ongoing development projects; identifies the technical gaps; discusses the priorities for resolution of the technical gaps;

and identifies the site parameters affecting the application of a specific containment method. The containment technology described in this document cover surface caps; vertical barriers such as slurry walls, grout curtains, sheet pilings, frozen soil barriers, and vitrified barriers; horizontal barriers; sorbent barriers; and gravel layers/curtains. Within DOE, containment technology could be used to prevent water infiltration into buried waste; to provide for long-term containment of pits, trenches, and buried waste sites; for the interim containment of leaking underground storage tanks and piping; for the removal of contaminants from groundwater to prevent contamination from migrating off-site; and as an interim measure to prevent the further migration of contamination during the application of an in situ treatment technology such as soil flushing. The ultimate goal is the implementation of containment technology at DOE sites as a cost-effective, efficient, and safe choice for environmental remediation and restoration activities.

51 (DOE/EM-0202) In Situ Remediation Integrated Program. In situ physical/chemical treatment technologies for remediation of contaminated sites: Applicability, developing status, and research needs. Siegrist, R.L.; Gates, D.D.; West, O.R.; Liang, L.; Donaldson, T.L.; Webb, O.F.; Corder, S.L.; Dickerson, K.S. Oak Ridge National Lab., TN (United States). Jun 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003294. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) In Situ Remediation Integrated Program (ISR IP) was established in June 1991 to facilitate the development and implementation of in situ remediation technologies for environmental restoration within the DOE complex. Within the ISR IP, four subareas of research have been identified: (1) in situ containment, (2) in situ physical/chemical treatment (ISPCT), (3) in situ bioremediation, and (4) subsurface manipulation/electrokinetics. Although set out as individual focus areas, these four are interrelated, and successful developments in one will often necessitate successful developments in another. In situ remediation technologies are increasingly being sought for environmental restoration due to the potential advantages that in situ technologies can offer as opposed to more traditional ex situ technologies. These advantages include limited site disruption, lower cost, reduced worker exposure, and treatment at depth under structures. While in situ remediation technologies can offer great advantages, many technology gaps exist in their application. This document presents an overview of ISPCT technologies and describes their applicability to DOE-complex needs, their development status, and relevant ongoing research. It also highlights research needs that the ISR IP should consider when making funding decisions.

52 (DOE/ID/13042-37, pp. 621) Characterization of a shallow canyon aquifer contaminated by mine tailings and suggestions for constructed wetlands treatment. Houck, J.C.; Mink, L.L. Idaho State Government, Boise, ID (United States). 1994. (CONF-9403128--: Hydrogeology, waste disposal, science and politics: 30. symposium on engineering geology and geotechnical engineering, Boise, ID (United States), 23-25 Mar 1994). In *Hydrogeology, waste disposal, science and politics: Proceedings*. 652p. Order Number DE94014144. Source: OSTI; NTIS; INIS.

A shallow aquifer consisting of mine tailings mixed with alluvial sediments is being investigated by the University of Idaho. The shallow aquifer is located in the lower Canyon

Creek drainage in the Coeur d'Alene Mining District of northern Idaho. Canyon Creek is a major contributor of dissolved heavy metal loads to the South Fork of the Coeur d'Alene River. Problem metals include zinc, lead, and cadmium. A total of 16 new monitoring wells were constructed in a 2.5 by .5 mile study area during summer of 1993 to map the water table configuration and collect water samples. A monitoring network of wells have been established in the Lower Canyon Creek valley which includes these 16 new monitoring wells, 5 monitoring wells installing previously, 10 domestic wells, and 7 wells located near tailing ponds. Water quality analyses for ground and surface water samples collected during low creek flow conditions are presented along with geologic, geophysical and geohydrological information.

53 (DOE/ID/13042-38) Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL. Monks, J.I. Idaho State Univ., Pocatello, ID (United States). 23 Sep 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-91ID13042. Order Number DE95001650. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the monitor wells that penetrate the upper portion of the Snake River Plain aquifer at the Idaho National Engineering Laboratory (INEL) are open over large intervals that include multiple water-bearing zones. Most of these wells are equipped with dedicated submersible pumps. Water of varying quality from different water-bearing zones is mixed within the wells. The hydrologic properties of individual water bearing zones are difficult to determine. Water quality and water-level data on organic, heavy metal, and radioactive contaminants have been collected, reported, and interpreted from these monitor wells for more than forty years. The problems associated with well completions over large intervals through multiple water-bearing zones raise significant questions about the data. A straddle-packer system was developed and applied at the INEL site to investigate the monitor well network. The straddle-packer system, hydraulic testing methods, data analysis procedures, and testing results are described in this report. The straddle-packer system and the straddle-packer testing and data evaluation procedures can be improved for future testing at the INEL site. Recommended improvements to the straddle-packer system are: (1) improved transducer pressure sensing systems, (2) faster opening riser valve, and (3) an in-line flowmeter in the riser pipe. Testing and data evaluation recommended improvements are: (1) simultaneous valve opening during slug tests, (2) analysis of the ratio of the times for head change and recovery to occur, (3) constant-drawdown tests of high transmissivity intervals, (4) multiple-well aquifer tests, and (5) long term head monitoring.

54 (DOE/ID/13042-39) Environmental Surveillance Program quarterly progress report, January-March 1994. Idaho INEL Oversight Program, Boise, ID (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-91ID13042. Order Number DE95001575. Source: OSTI; NTIS; GPO Dep.

The Environmental Surveillance Program is a field monitoring system primarily conceived to determine the environmental presence of contaminants that may have originated from Idaho National Engineering Laboratory (INEL) facilities or operations. The Environmental Surveillance Program is operated out of the Oversight Program's Idaho Falls Field Office in collaboration with Idaho State

University, Idaho Department of Water Resources, the National Oceanographic and Atmospheric Administration Air Resources Laboratory Field Research Division and the US Geological Survey (USGS) to monitor air, water and terrestrial components of the INEL and surrounding environments. The Environmental Surveillance Program was also designed to support radiological emergency response capabilities for the State of Idaho. The Environmental Surveillance Program provides data to complement, supplement and verify monitoring coverage provided by other groups. Taken collectively, the total amount of data available is expected to provide a more complete view of environmental conditions. These arrangements improve verification without sacrificing necessary elements of independent performance. Besides its technical value, the Environmental Surveillance Program's contribution to the overall surveillance database is of significant value in public communication and education. This progress report presents the results of analyses performed on samples collected during the first quarter (January-March), 1994. Not all sample analyses were complete at report publication. Some results from samples collected during this period will appear in the next quarterly progress report.

55 (DOE/ID-22115) Iodine-129 in the Snake River Plain aquifer at and near the Idaho National Engineering Laboratory, Idaho, 1990-91. Mann, L.J. (Geological Survey, Idaho Falls, ID (United States)); Beasley, T.M. (Geological Survey, Idaho Falls, ID (United States)). Apr 1994. 31p. Sponsored by USDOE, Washington, DC (United States); Department of the Interior, Washington, DC (United States). (USGS-WRI-94-4053). Order Number DE95001913. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225; GPO Dep.

Iodine-129 is one of the fission products contained in wastewater at the ICPP. Most of the wastewater was injected directly to the Snake River Plain aquifer through a 598-ft-deep disposal well or was discharged to unlined disposal ponds. Because of its 15.7 million-year half-life, iodine-129 is a permanent environmental pollutant. In 1990-1991, water samples were collected from 51 wells that obtain water from the aquifer and analyzed for iodine-129. The water samples were analyzed using the AMS method. The detection limit for this method is from two to six orders of magnitude more sensitive than the detection limit for neutron-activation method, which was used for samples collected in 1977, 1981, and 1986. Because of the more sensitive method detection limit, iodine-129 was detected in water from a larger number of wells distributed over a larger area.

56 (DOE/MC/27346-95/C0430) The circulating air barrier: Effective prevention of liquid contaminant movement through soil. Towers, T.; Overbey, W. K and M Engineering and Consulting Corp., Washington, DC (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27346. (CONF-9411149-15: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007691. Source: OSTI; NTIS; INIS; GPO Dep.

Objectives of this task included design, modeling, selection of drilling and surface processing equipment, and development of test procedures and cost estimates for conducting a cold test demonstration of the Circulating Air

Barrier (CAB) process. The demonstration configuration is scaled to a prototype CAB system designed specifically for the C Tank Farm at the Hanford Site. The CAB system is designed to function as a containment barrier to prevent contamination of the water table located approximately 200 feet below the base of the C-Tank-Farm underground storage tanks. The CAB system is a desiccant-type barrier designed to prevent the migration of liquid contaminants toward the ground water by using an air circulation and processing system to lower the saturation in a targeted subsurface zone below the saturation level required for liquid flow through that zone. The CAB system offers several important advantages, including the fact that it is a non-physical confinement technology, it has an active monitoring and leak detection capability, it is based on proven, commercially available equipment and oil and gas technologies; it has excellent potential for emergency response and rapid deployment; and offers high potential for integration with other remediation technologies. Demonstration- and full-scale CAB systems have been designed for the Hanford Site as part of this task.

57 (DOE/MC/29110-3879) **Organic sponges for cost-effective CVOC abatement. Final report, September 1992-April 1994.** Flanagan, W.P.; Grade, M.M.; Horney, D.P.; Mackenzie, P.D.; Salvo, J.J.; Sivavec, T.M.; Stephens, M.L. General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center. Jul 1994. 357p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29110. Order Number DE95000004. Source: OSTI; NTIS; INIS; GPO Dep.

Air contaminated with CVOCs (chlorinated volatile organic compounds) arise from air stripping of ground water or from soil and dual phase vapor extraction. A research program was undertaken to develop sorbents better than activated carbon for remediation. Two such sorbents were found: Dow's XUS polymer and Rohm and Haas' Amborsorb 563 (carbonaceous). Opportunities exist to further develop sorption and biodegradation technologies.

58 (DOE/MC/29111-95/C0441) **Laboratory and pilot field-scale testing of surfactants for environmental restoration of chlorinated solvent DNAPLs.** Jackson, R.E. (INTERA, Inc., Austin, TX (United States)); Fountain, J.C. INTERA, Inc., Austin, TX (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29111. (CONF-9411149-22: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95008363. Source: OSTI; NTIS; INIS; GPO Dep.

This project is composed of two phases and has the objective of demonstrating surfactant-enhanced aquifer remediation (SEAR) as a practical remediation technology at DOE sites with ground water contaminated by dense, non-aqueous phase liquids (DNAPLs), in particular, chlorinated solvents. The first phase of this project, Laboratory and Pilot Field Scale Testing, which is the subject of the work so far, involves (1) laboratory experiments to examine the solubilization of multiple component DNAPLs, e.g., solvents such as perchloroethylene (PCE) and trichloroethylene (TCE), by dilute surfactant solutions, and (2) a field test to demonstrate SEAR technology on a small scale and in an existing well.

59 (DOE/MC/29119-95/C0429) **Innovative directional and position specific sampling technique.** Foster, E.L. UTD, Inc., Newington, VA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States).

DOE Contract AC21-92MC29119. (CONF-9411149-21: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95008362. Source: OSTI; NTIS; GPO Dep.

The main objective of UTD's completed contract was to demonstrate the accuracy UTD Position Locator (POLO) system for penetrometer applications. The contract work was accomplished in three phases. Phase I involved sub-scale refinement of the POLO sub-systems which included the design and testing of individual components of POLO. The objectives of Phase II were to integrate a prototype POLO unit and demonstrate its accuracy through laboratory tracking experiments. Phase III objectives included manufacturing and assembly of a full-scale POLO unit and demonstration of its accuracy under field conditions. The success criterion for the entire contract was to calculate the penetrometer tip position with 0.5% accuracy or better with respect to distance traveled both in laboratory and field tests. This criterion was satisfied in Phase II laboratory tests and in Phase III field tests at two different sites. With successful completion of the contract in September, 1994, UTD has embarked on a commercialization plan in order to make commercial POLO units available to DOE contractors and penetrometer users in a timely fashion.

60 (DOE/MC/29119-3881) **Innovative directional and position specific sampling technique. Phase 3: Final report, July 1992-September 1994.** Hutzal, W.J.; Hill, J.L. III; Foster, E.L. UTD, Inc., Newington, VA (United States). Sep 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29119. Order Number DE95000006. Source: OSTI; NTIS; INIS; GPO Dep.

The POLO System is a major enhancement to the state of the art for subsurface environmental restoration equipment. The system locates the tip position of penetrometer probes as they are placed underground while meeting the rigid constraints of environmental restoration applications. POLO is applicable to small diameter probes, does not obstruct the center of the probe, is rugged, is unaffected by the presence of steel or other magnetic material, and is capable of remote operation beneath underground tanks or foundations. The development and adaptation of the POLO System for use with penetrometers has progressed through three development phases prior to commercialization. Phases I and II of the contract included the design, testing, and integration of all components of the POLO device. Efforts were made to simulate field conditions in terms of the scale of the components as well as the operating environment. The preestablished success criterion, which has been maintained throughout the research, was to demonstrate path tracking with a total error of less than 0.50% of the distance traveled for distances less than 70 meters. The results tests on individual POLO components showed that the equipment met or exceeded the success criterion. Phase II laboratory scale path tracking experiments also met the success criterion. Phase III moved the POLO System into the field. The full-scale field demonstration tested the ability of the new POLO Module to track the path of a small diameter probe as it moved underground.

61 (DOE/MC/30360-95/C0425) **Acoustically enhanced remediation of contaminated soil and ground water.** Iovenitti, J.L.; Rynne, T.M.; Spencer, J.W. Jr. Weiss Associates, Emeryville, CA (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States).

DOE Contract AR21-94MC30360. (CONF-9411149-12: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007721. Source: OSTI; NTIS; GPO Dep.

This program systematically evaluates the use of acoustic excitation fields (AEFs) to increase fluid and contaminant extraction rates from a wide range of unconsolidated soils. Successful completion of this program will result in a commercially-viable, advanced in-situ remediation technology that will significantly reduce clean-up times and costs. This technology should have wide applicability since it is envisioned to augment existing remediation technologies, such as traditional pump and treat and soil vapor extraction, not replace them. The overall program has three phases: Phase 1—laboratory scale parametric investigation; Phase 2—technology scaling study; Phase 3—field demonstration. Phase 1 of the program, corresponding to this period of performance, has as its primary objectives to provide a laboratory-scale proof of concept, and to fully characterize the effects of AEFs on fluid and contaminant extraction rates in a wide variety of soil types. The laboratory measurements of the soil transport properties and process parameters will be used in a computer model of the enhanced remediation process. A Technology Merit and Trade Study will complete Phase 1.

62 (DOE/OR-01-1252-D1) **Remedial Investigation work plan for the Groundwater Operable Unit at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Mar 1994. 342p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-221-D1). Order Number DE94015937. Source: OSTI; NTIS; INIS; GPO Dep.

This Remedial Investigation (RI) Work Plan has been developed as part of the US Department of Energy's (DOE's) investigation of the Groundwater Operable Unit (GWOU) at Oak Ridge National Laboratory (ORNL) located near Oak Ridge, Tennessee. The first iteration of the GWOU RI Work Plan is intended to serve as a strategy document to guide the ORNL GWOU RI. The Work Plan provides a rationale and organization for groundwater data acquisition, monitoring, and remedial actions to be performed during implementation of environmental restoration activities associated with the ORNL GWOU. It is important to note that the RI Work Plan for the ORNL GWOU is not a prototypical work plan. The RI will be conducted using annual work plans to manage the work activities, and task reports will be used to document the results of the investigations. Sampling and analysis results will be compiled and reported annually with a review of data relative to risk (screening level risk assessment review) for groundwater. This Work Plan outlines the overall strategy for the RI and defines tasks which are to be conducted during the initial phase of investigation. This plan is presented with the understanding that more specific addenda to the plan will follow.

63 (DOE/OR-01-1252-D2) **Characterization plan for the Oak Ridge National Laboratory Area-Wide Groundwater Program, Oak Ridge, Tennessee.** Department of Energy, Oak Ridge, TN (United States). Oak Ridge Operations Office; Oak Ridge National Lab., TN (United States). Aug 1994. 455p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400.

(ORNL/ER-221-D2). Order Number DE95000632. Source: OSTI; NTIS; INIS; GPO Dep.

This characterization plan has been developed as part of the U.S. Department of Energy's (DOE's) investigation of the Groundwater Operable Unit (GWOU) at Oak Ridge National Laboratory (ORNL) located near Oak Ridge, Tennessee. The first iteration of the characterization plan is intended to serve as a strategy document to guide subsequent GWOU remedial investigations. The plan provides a rationale and organization for groundwater data acquisition, monitoring, and remedial actions to be performed during implementation of environmental restoration activities associated with the ORNL GWOU. It is important to note that the characterization plan for the ORNL GWOU is not a prototypical work plan. As such, remedial investigations will be conducted using annual work plans to manage the work activities, and task reports will be used to document the results of the investigations. Sampling and analysis results will be compiled and reported annually with a review of data relative to risk (screening level risk assessment review) for groundwater. This characterization plan outlines the overall strategy for the remedial investigations and defines tasks that are to be conducted during the initial phase of investigation. This plan is presented with the understanding that more specific addenda to the plan will follow.

64 (DOE/OR-01-1282-D1) **Remedial investigation/feasibility study report for lower Watts Bar Reservoir Operable Unit.** Oak Ridge National Lab., TN (United States). Aug 1994. 410p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-244-D1). Order Number DE94019241. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the combined Remedial Investigation and Feasibility Study Report for the Lower Watts Bar Reservoir (LWBR) Operable Unit (OU). The LWBR is located in Roane, Rhea, and Meigs counties, Tennessee, and consists of Watts Bar Reservoir downstream of the Clinch River. This area has received hazardous substances released over a period of 50 years from the U.S. Department of Energy's Oak Ridge Reservation (ORR), a National Priority List site established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). As required by this law, the ORR and all off-site areas that have received containments, including LWBR, must be investigated to determine the risk to human health and the environment resulting from these releases, the need for any remedial action to reduce these risks, and the remedial actions that are most feasible for implementation in this OU. Contaminants from the ORR are primarily transported to the LWBR via the Clinch River. Water-soluble contaminants released to ORR surface waters are rapidly diluted upon entering the Clinch River and then quickly transported downstream to the Tennessee River where further dilution occurs. Almost the entire quantity of these diluted contaminants rapidly flows through LWBR. In contrast, particle-associated contaminants tend to accumulate in the lower Clinch River and in LWBR in areas of sediment deposition. Those particle-associated contaminants that were released in peak quantities during the early years of ORR operations (e.g., mercury and ¹³⁷Cs) are buried under as much as 80 cm of cleaner sediment in LWBR. Certain contaminants, most notably polychlorinated biphenyls (PCBs), have accumulated in LWBR biota. The contamination of aquatic biota with PCBs is best documented for certain fish

species and extends to reservoirs upstream of the ORR, indicating a contamination problem that is regional in scope and not specific to the ORR.

65 (DOE/OR-01-1282-D4) Remedial investigation/feasibility study report for Lower Watts Bar Reservoir Operable Unit. Oak Ridge National Lab., TN (United States); Jacobs Engineering Group, Inc., Pasadena, CA (United States). Mar 1995. 410p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-244-D4). Order Number DE95008652. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the combined Remedial Investigation and Feasibility Study Report for the lower Watts Bar Reservoir (LWBR) Operable Unit (OU). The LWBR is located in Roane, Rhea, and Meigs counties, Tennessee, and consists of Watts Bar Reservoir downstream of the Clinch river. This area has received hazardous substances released over a period of 50 years from the US Department of Energy's Oak Ridge Reservation (ORR), a National Priority List site established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). As required by this law, the ORR and all off-site areas that have received contaminants, including LWBR, must be investigated to determine the risk to human health and the environment resulting from these releases, the need for any remedial action to reduce these risks, and the remedial actions that are most feasible for implementation in this OU. Contaminants from the ORR are primarily transported to the LWBR via the Clinch River. There is little data regarding the quantities of most contaminants potentially released from the ORR to the Clinch River, particularly for the early years of ORR operations. Estimates of the quantities released during this period are available for most radionuclides and some inorganic contaminants, indicating that releases 30 to 50 years ago were much higher than today. Since the early 1970s, the release of potential contaminants has been monitored for compliance with environmental law and reported in the annual environmental monitoring reports for the ORR.

66 (DOE/OR/21865-1) Streamflow, specific-conductance, and temperature data for Bayou and Little Bayou Creeks near Paducah, Kentucky, August 15 and 16, 1989. Evaldi, R.D.; McClain, D.L. Geological Survey, Las Vegas, NV (United States). 1989. 19p. Sponsored by USDOE, Washington, DC (United States); Department of the Interior, Washington, DC (United States). DOE Contract A105-89OR21865. (USGS-OFR-89-582). Order Number DE95001701. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Books and Open-File Reports, Box 25425, Federal Center, Denver, CO 80225; GPO Dep.

Discharge, temperature, and specific conductance measurements were made August 15 and 16, 1989, at 74 main channel sites and seven tributaries on Bayou and Little Bayou Creeks in the vicinity of the Paducah Gaseous Diffusion Plant. These measurements were made during base flow conditions to provide data for analysis of the interaction of surface and ground water. The discharge of Bayou Creek was 0.30 cubic feet per second (ft^3/s) at the most upstream site, and 5.8 ft^3/s at the most downstream site. Total measured tributary inflow of Bayou Creek was 5.7 ft^3/s . Specific conductance values in the Bayou Creek watershed ranged from 208 to 489 microsiemens per centimeter ($\mu\text{S}/\text{cm}$), and water temperature ranged from 20.0 to 32.6 degrees Celsius ($^{\circ}\text{C}$). The discharge of Little Bayou Creek was 0.65 ft^3/s at the most upstream site, and 1.8 ft^3/s at the most downstream site. Total measured tributary inflow of Little Bayou

Creek was 0.38 ft^3/s . Specific conductance values in the Little Bayou Creek watershed ranged from 211 to 272 $\mu\text{S}/\text{cm}$, and water temperature ranged from 14.5 to 24.9 $^{\circ}\text{C}$.

67 (DOE/OR/22160-T10) Demonstration testing and evaluation of in situ soil heating: Treatability study work plan, Revision 1. Sresty, G.C. IIT Research Inst., Chicago, IL (United States). 7 Jul 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE94015049. Source: OSTI; NTIS; INIS; GPO Dep.

A Treatability Study planned for the demonstration of the in situ electromagnetic (EM) heating process to remove organic solvents is described in this Work Plan. The treatability study will be conducted by heating subsurface vadose-zone soils in an organic plume adjacent to the Classified Burial Ground K-1070-D located at K-25 Site, Oak Ridge. The test is scheduled to start during the fourth quarter of FY94 and will be completed during the first quarter of FY95. The EM heating process for soil decontamination is based on volumetric heating technologies developed during the '70s for the recovery of fuels from shale and tar sands by IIT Research Institute (IITRI) under a co-operative program with the US Department of Energy (DOE). Additional modifications of the technology developed during the mid '80s are currently used for the production of heavy oil and waste treatment. Over the last nine years, a number of Government agencies (EPA, Army, AF, and DOE) and industries sponsored further development and testing of the in situ heating and soil decontamination process for the remediation of soils containing hazardous organic contaminants. In this process the soil is heated in situ using electrical energy. The contaminants are removed from the soil due to enhanced vaporization, steam distillation and stripping. IITRI will demonstrate the EM Process for in situ soil decontamination at K-25 Site under the proposed treatability study. Most of the contaminants of concern are volatile organics which can be removed by heating the soil to a temperature range of 85 to 95 C. The efficiency of the treatment will be determined by comparing the concentration of contaminants in soil samples. Samples will be obtained before and after the demonstration for a measurement of the concentration of contaminants of concern.

68 (DOE/OR/22160-T12) Demonstration testing and evaluation of in situ soil heating: Revision 1, Demonstration system design. Dev, H. IIT Research Inst., Chicago, IL (United States). 16 Aug 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE94017164. Source: OSTI; NTIS; INIS; GPO Dep.

Over the last nine years IIT Research Institute (IITRI) has been developing and testing the in situ heating and soil decontamination process for the remediation of soils containing hazardous organic contaminants. In this process the soil is heated in situ using electrical energy. The contaminants are removed from the soil due to enhanced vaporization, steam distillation and stripping. The vaporized contaminants, water vapor and air are recovered from the heated zone by means of a vacuum manifold system which collects gases from below surface as well as from the soil surface. A vapor barrier is used to prevent fugitive emissions of the contaminants and to control air infiltration to minimize dilution of the contaminant gases and vapors. The recovered gases and vapors are conveyed to an on site vapor treatment system for the clean up of the vent gases. Electrical energy is applied to the soil by forming an array of

electrodes in the soil which are electrically interconnected and supplied with power. The electrodes are placed in drilled bore holes which are made through the contaminated zone. There are two versions of the in situ heating and soil treatment process; the first version is called the In Situ Radio Frequency (RF) Soil Decontamination Process and the second version is called the In Situ Electromagnetic (EM) Soil Decontamination Process. The first version, the RF Process is capable of heating the soil in a temperature range of 100° to 400°C. The soil temperature in the second version, the EM Process, is limited to the boiling point of water under native conditions. Thus the soil will be heated to a temperature of about 85° to 95°C. In this project IITRI will demonstrate the EM Process for in situ soil decontamination at K-25 Site due to the fact that most of the contaminants of concern are volatile organics which can be removed by heating the soil to a temperature range of 85° to 95°C.

69 (DOE/OR/22160-T14) Demonstration testing and evaluation of in situ soil heating. Treatability study work plan (Revision 2). Sresty, G.C. IIT Research Inst., Chicago, IL (United States). 30 Dec 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE95004858. Source: OSTI; NTIS; INIS; GPO Dep.

A Treatability Study planned for the demonstration of the in situ electromagnetic (EM) heating process to remove organic solvents is described in this Work Plan. The treatability study will be conducted by heating subsurface vadose-zone soils in an organic plume adjacent to the Classified Burial Ground K-1070-D located at K-25 Site, Oak Ridge. The test is scheduled to start during the fourth quarter of FY94 and will be completed during the first quarter of FY95. Over the last nine years, a number of Government agencies (EPA, Army, AF, and DOE) and industries sponsored further development and testing of the in situ heating and soil decontamination process for the remediation of soils containing hazardous organic contaminants. In this process the soil is heated in situ using electrical energy. The contaminants are removed from the soil due to enhanced vaporization, steam distillation and stripping. IITRI will demonstrate the EM Process for in situ soil decontamination at K-25 Site under the proposed treatability study. Most of the contaminants of concern are volatile organics which can be removed by heating the soil to a temperature range of 85° to 95°C. The efficiency of the treatment will be determined by comparing the concentration of contaminants in soil samples. Samples will be obtained before and after the demonstration for a measurement of the concentration of contaminants of concern. This document is a Treatability Study Work Plan for the demonstration program. The document contains a description of the proposed treatability study, background of the EM heating process, description of the field equipment, and demonstration test design.

70 (DOE/OR/22160-T15) Demonstration testing and evaluation of in situ soil heating. Health and safety plan (Revision 2). Dev, H. IIT Research Inst., Chicago, IL (United States). 28 Dec 1994. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE95004859. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the Health and Safety Plan (HASP) for the demonstration of IITRI's EM Treatment Technology. In this process, soil is heated in situ by means of electrical energy for the removal of hazardous organic contaminants.

This process will be demonstrated on a small plot of contaminated soil located in the Pit Area of Classified Burial Ground K-1070-D, K-25 Site, Oak Ridge, TN. The purpose of the demonstration is to remove organic contaminants present in the soil by heating to a temperature range of 85° to 95°C. The soil will be heated in situ by applying 60-Hz AC power to an array of electrodes placed in boreholes drilled through the soil. In this section a brief description of the process is given along with a description of the site and a listing of the contaminants found in the area.

71 (DOE/OR/22160-T16) Demonstration testing and evaluation of in situ heating of soil. IIT Research Inst., Chicago, IL (United States). Jan 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE95007074. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Quality Assurance Project Plan (QAPP) for IITRI Project C06787 entitled "Demonstration Testing and Evaluation of In Situ Heating of Soil". A work plan for the above mentioned work was previously submitted. This QAPP describes the sampling and analysis of soil core-samples obtained from the K-25 Site (Oak Ridge Gaseous Diffusion Plant) where an in-situ heating and soil decontamination demonstration experiment will be performed. Soil samples taken before and after the experiment will be analyzed for selected volatile organic compounds. The Work Plan mentioned above provides a complete description of the demonstration site, the soil sampling plan, test plan, etc.

72 (DOE/OSTI-11680) Waste Contaminants at Military Bases Working Group report. Western Governors' Association, Denver, CO (United States); Federal Advisory Committee to Develop On-Site Innovative Technologies, Washington, DC (United States). 4 Nov 1993. 48p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States); Department of the Interior, Washington, DC (United States); Department of Defense, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

The Waste Contaminants at Military Bases Working Group has screened six prospective demonstration projects for consideration by the Federal Advisory Committee to Develop On-Site Innovative Technologies (DOIT). These projects include the Kirtland Air Force Base Demonstration Project, the March Air Force Base Demonstration Project, the McClellan Air Force Base Demonstration Project, the Williams Air Force Base Demonstration Project, and two demonstration projects under the Air Force Center for Environmental Excellence. A seventh project (Port Hueneme Naval Construction Battalion Center) was added to list of prospective demonstrations after the September 1993 Working Group Meeting. This demonstration project has not been screened by the working group. Two additional Air Force remediation programs are also under consideration and are described in Section 6 of this document. The following information on prospective demonstrations was collected by the Waste Contaminants at Military Bases Working Group to assist the DOIT Committee in making Phase 1 Demonstration Project recommendations. The remainder of this report is organized into seven sections: Work Group Charter's mission and vision; contamination problems, current technology limitations, and institutional and regulatory barriers to technology development and commercialization, and work force issues; screening process for initial Phase 1 demonstration technologies and sites; demonstration descriptions – good

matches; demonstration descriptions – close matches; additional candidate demonstration projects; and next steps.

73 (DOE/OSTI-11681) Military Munitions Waste Working Group report. Western Governors' Association, Denver, CO (United States); Federal Advisory Committee to Develop On-Site Innovative Technologies, Washington, DC (United States). 30 Nov 1993. 73p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States); Department of the Interior, Washington, DC (United States); Department of Defense, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

This report presents the findings of the Military Munitions Waste Working Group in its effort to achieve the goals directed under the Federal Advisory Committee to Develop On-Site Innovative Technologies (DOIT Committee) for environmental restoration and waste management. The Military Munitions Waste Working Group identified the following seven areas of concern associated with the ordnance (energetics) waste stream: unexploded ordnance; stockpiled; disposed – at known locations, i.e., disposal pits; discharged – impact areas, unknown disposal sites; contaminated media; chemical sureties/weapons; biological weapons; munitions production; depleted uranium; and rocket motor and fuel disposal (open burn/open detonation). Because of time constraints, the Military Munitions Waste Working Group has focused on unexploded ordnance and contaminated media with the understanding that remaining waste streams will be considered as time permits. Contents of this report are as follows: executive summary; introduction; Military Munitions Waste Working Group charter; description of priority waste stream problems; shortcomings of existing approaches, processes and technologies; innovative approaches, processes and technologies, work force planning, training, and education issues relative to technology development and cleanup; criteria used to identify and screen potential demonstration projects; list of potential candidate demonstration projects for the DOIT committee decision/recommendation and appendices.

74 (DOE/OSTI-11682) Coordinating Group report. Western Governors' Association, Denver, CO (United States); Federal Advisory Committee to Develop On-Site Innovative Technologies, Washington, DC (United States). Jan 1994. 62p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States); Department of the Interior, Washington, DC (United States); Department of Defense, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

In December 1992, western governors and four federal agencies established a Federal Advisory Committee to Develop On-site Innovative Technologies for Environmental Restoration and Waste Management (the DOIT Committee). The purpose of the Committee is to advise the federal government on ways to improve waste cleanup technology development and the cleanup of federal sites in the West. The Committee directed in January 1993 that information be collected from a wide range of potential stakeholders and that innovative technology candidate projects be identified, organized, set in motion, and evaluated to test new partnerships, regulatory approaches, and technologies which will lead to improve site cleanup. Five working groups were organized, one to develop broad project selection and evaluation criteria and four to focus on specific contaminant problems. A Coordinating Group comprised of working group spokesmen and federal and state representatives,

was set up to plan and organize the routine functioning of these working groups. The working groups were charged with defining particular contaminant problems; identifying shortcomings in technology development, stakeholder involvement, regulatory review, and commercialization which impede the resolution of these problems; and identifying candidate sites or technologies which could serve as regional innovative demonstration projects to test new approaches to overcome the shortcomings. This report from the Coordinating Group to the DOIT Committee highlights the key findings and opportunities uncovered by these fact-finding working groups. It provides a basis from which recommendations from the DOIT Committee to the federal government can be made. It also includes observations from two public roundtables, one on commercialization and another on regulatory and institutional barriers impeding technology development and cleanup.

75 (DOE/OSTI-11683) Abandoned Mine Waste Working Group report. Western Governors' Association, Denver, CO (United States); Federal Advisory Committee to Develop On-Site Innovative Technologies, Washington, DC (United States). 10 Dec 1993. 51p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States); Department of the Interior, Washington, DC (United States); Department of Defense, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

The Mine Waste Working Group discussed the nature and possible contributions to the solution of this class of waste problem at length. There was a consensus that the mine waste problem presented some fundamental differences from the other classes of waste addresses by the Develop On-Site Innovative Technologies (DOIT) working groups. Contents of this report are: executive summary; stakeholders address the problems; the mine waste program; current technology development programs; problems and issues that need to be addressed; demonstration projects to test solutions; conclusion-next steps; and appendices.

76 (DOE/RL-89-12-Rev.2-Draft-A) Hanford site ground water protection management plan. Department of Energy, Richland, WA (United States). Richland Operations Office. Oct 1994. 72p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003266. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water protection at the Hanford Site consists of preventative and remedial measures that are implemented in compliance with a variety of environmental regulations at local, state, and federal levels. These measures seek to ensure that the resource can sustain a broad range of beneficial uses. To effectively coordinate and ensure compliance with applicable regulations, the U.S. Department of Energy has issued DOE Order 5400.1 (DOE 1988a). This order requires all U.S. Department of Energy facilities to prepare separate ground water protection program descriptions and plans. This document describes the Ground Water Protection Management Plan (GPMP) for the Hanford Site located in the state of Washington. DOE Order 5400.1 specifies that the GPMP covers the following general topical areas: (1) documentation of the ground water regime; (2) design and implementation of a ground water monitoring program to support resource management and comply with applicable laws and regulations; (3) a management program for ground water protection and remediation; (4) a summary and identification of areas that may be contaminated with hazardous waste; (5) strategies for controlling hazardous waste

sources; (6) a remedial action program; and (7) decontamination, decommissioning, and related remedial action requirements. Many of the above elements are currently covered by existing programs at the Hanford Site; thus, one of the primary purposes of this document is to provide a framework for coordination of existing ground water protection activities. The GPMP provides the ground water protection policy and strategies for ground water protection/management at the Hanford Site, as well as an implementation plan to improve coordination of site ground water activities.

77 (DOE/RL-93-33-Draft-A) Focused feasibility study of engineered barriers for waste management units in the 200 Areas. Bechtel National, Inc., Richland, WA (United States). Feb 1995. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008218. Source: OSTI; NTIS; INIS; GPO Dep.

The 200 Areas of the U.S. Department of Energy Hanford Site are included on the National Priorities List (NPL) under the CERCLA Act of 1980. Inclusion on the NPL initiates the Remedial Investigation (RI) and Feasibility Study (FS) process of characterizing the nature and extent of contamination and selecting remedial actions. Under the Hanford Federal Facility Agreement and Consent Order, ten Aggregate Area Management Studies (AAMS) were prepared for the 200 Areas in support of RI/FS activities. These AAMS reports summarize characterization information for 200 Area waste management units (WMUs), arrange WMUs into analogous groups, and recommend a range of potential remedial technologies. The AAMS studies also recommended that focused feasibility studies (FFS) be performed for those alternatives that have broad application and are considered viable from an effectiveness, implementability, and cost standpoint. One particular alternative recommended in the AAMS reports for an FFS is remediation with surface barriers. Based on that recommendation, this FFS was undertaken. This report describes three proposed conceptual barrier designs which meet all regulatory design requirements for IRM and LFI candidate WMUs and provide a range of cover options to minimize health and environmental risks in the most cost effective manner.

78 (DOE/RL-93-37) Limited field investigation report for the 100-BC-5 Operable Unit. USDOE Richland Operations Office, WA (United States). Jul 1994. 78p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94015330. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) was conducted to assess the applicability of interim remedial measures (IRM) for reducing human health and environmental risks within the 100-BC-5 Groundwater Operable Unit. The 100-BC-5 Operable Unit is one of three operable units associated with the 100 B/C Area. Operable units 1 and 2 address contaminant sources while 100-BC-5 addresses contamination present in the underlying groundwater. The primary method of investigation used during this LFI was the installation of monitoring wells. Samples were collected from the groundwater and soils and submitted for laboratory analysis. Boreholes were surveyed for radiological contamination using downhole geophysical techniques to further delineate the locations and levels of contaminants. All samples were screened to ascertain the presence of volatile organic compounds and radionuclides. Analytical data were subjected to validation; all first round and 10% of the subsequent rounds of data associated with the LFI were validated. The screening method

was used to identify contaminants of potential concern (COPC). This screening method eliminated from further consideration constituents that were below background. Constituents considered nontoxic to humans were eliminated from the human health evaluation. Inconsistency and blank contamination were also evaluated in the screening process. These COPC were evaluated further in the qualitative risk assessment (QRA). Tritium and strontium-90 were identified as contaminants of concern at 100-BC-5 because the concentrations exceeded potential applicable or relevant and appropriate requirements. The QRA determined that the risk is low for all of the site contaminants.

79 (DOE/RL-93-105) Pilot-scale treatability test plan for the 200-UP-1 groundwater Operable Unit. Wittreich, C.D. USDOE Richland Operations Office, WA (United States). May 1994. 72p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014126. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the treatability test plan for pilot-scale pump and treat testing at the 200-UP-1 Operable Unit. This treatability test plan has been prepared in response to an agreement between the US Department of Energy, the US Environmental Protection Agency, and the Washington State Department of Ecology, as documented in Hanford Federal Facility Agreement and Consent Order (Ecology et al. 1989a) Change Control Form M-13-93-03 (Ecology et al. 1994). The agreement also requires that, following completion of the activities described in this test plan, a 200-UP-1 Operable Unit interim remedial measure (IRM) proposed plan be developed for use in preparing an interim action record of decision (ROD). The IRM Proposed Plan will be supported by the results of the testing described in this treatability test plan, as well as by other 200-UP-1 Operable Unit activities (e.g., limited field investigation, development of a qualitative risk assessment). Once issued, the interim action ROD will specify the interim action for groundwater contamination at the 200-UP-1 Operable Unit. The approach discussed in this treatability test plan is to conduct a pilot-scale pump and treat test for the contaminant plume associated with the 200-UP-1 Operable Unit. Primary contaminants of concern are uranium and technetium-99; the secondary contaminant of concern is nitrate. The pilot-scale treatability testing presented in this test plan has as its primary purpose to assess the performance of aboveground treatment systems with respect to the ability to remove the primary contaminants in groundwater withdrawn from the contaminant plume.

80 (DOE/RL-94-23) State Waste Discharge Permit application, 183-N Backwash Discharge Pond. USDOE Richland Operations Office, WA (United States). Jun 1994. 130p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94015758. Source: OSTI; NTIS; GPO Dep.

As part of the Hanford Federal Facility Agreement and Consent Order negotiations (Ecology et al. 1994), the US Department of Energy, Richland Operations Office, the US Environmental Protection Agency, and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground on the Hanford Site which affect groundwater or have the potential to affect groundwater would be subject to permitting under the structure of Chapter 173-216 (or 173-218 where applicable) of the Washington Administrative Code, the State Waste Discharge Permit Program. As a result of this decision, the Washington State Department of

Ecology and the US Department of Energy, Richland Operations Office entered into Consent Order No. DE91NM-177, (Ecology and DOE-RL 1991). The Consent Order No. DE91NM-177 requires a series of permitting activities for liquid effluent discharges. Liquid effluents on the Hanford Site have been classified as Phase I, Phase II, and Miscellaneous Streams. The Consent Order No. DE91NM-177 establishes milestones for State Waste Discharge Permit application submittals for all Phase I and Phase II streams, as well as the following 11 Miscellaneous Streams as identified in Table 4 of the Consent Order No. DE91NM-177.

81 (DOE/RL-94-36-2) Quarterly report of RCRA groundwater monitoring data for period April 1 through June 30, 1994. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 446p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002950. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford Site interim-status groundwater monitoring projects are conducted as either background, indicator parameter evaluation, or groundwater quality assessment monitoring programs as defined in the Resource Conservation and Recovery Act of 1976 (RCRA); and "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," as amended (40 Code of Federal Regulations [CFR] 265). Compliance with the 40 CFR 265 regulations is required by the Washington Administrative Code (WAC) 173-303. This report contains data from Hanford Site groundwater monitoring projects. Westinghouse Hanford Company manages RCRA groundwater monitoring projects for federal facilities on the Hanford Site. Project management, specifying data needs, performing quality control oversight, managing data, and preparing project sampling schedules are all parts of this responsibility. This quarterly report contains data received between May 20 and August 19, 1994, which are the cutoff dates for this reporting period. This report may contain not only data from the April through June quarter but also data from earlier sampling events that were not previously reported.

82 (DOE/RL-94-36-3) Quarterly report of RCRA groundwater monitoring data for period July 1 through September 30, 1994. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006800. Source: OSTI; NTIS; GPO Dep.

Hanford Site interim-status groundwater monitoring projects are conducted as either background, indicator parameter evaluation, or groundwater quality assessment monitoring programs as defined in the Resource Conservation and Recovery Act of 1976 (RCRA); and "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," as amended. Compliance with the 40 CFR 265 regulations is required by the Washington Administrative Code (WAC) 173-303. This report contains data from Hanford Site groundwater monitoring projects. Westinghouse Hanford Company (WHC) manages RCRA groundwater monitoring projects for federal facilities on the Hanford Site. Project management, specifying data needs, performing quality control (QC) oversight, managing data, and preparing project sampling schedules are all parts of this responsibility. Pacific Northwest Laboratory (PNL) administers the contract for analytical services and provides groundwater sampling services to WHC for the

RCRA groundwater monitoring program. This quarterly report contains data received between August 20 and November 18, 1994, which are the cutoff dates for this reporting period. This report may contain not only data from the July through September quarter but also data from earlier sampling events that were not previously reported. The quarterly report is a means of reporting groundwater data that were collected from the previous quarter. No interpretation on the data is done during the quarterly reporting process. Interpretation of all data is presented in the Annual Report for RCRA Groundwater Monitoring Projects at the Hanford Site for that reporting year.

83 (DOE/RL-94-76) Constructability report for the 200-BP-1 prototype surface barrier. USDOE Richland Operations Office, WA (United States). Sep 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95004872. Source: OSTI; NTIS; INIS; GPO Dep.

The development of permanent isolation surface barriers is critical to supporting the Hanford Site environmental restoration mission. In-place management of certain waste management units may be the most desirable closure for many waste sites at Hanford. Remedial action objectives outlined in Phase I Remedial Investigation Report for the 200-BP-1 Operable Unit (DOE-RL 1993b), suggest that a likely remedial action could involve the use of a surface barrier. To further evaluate this technology, a Treatability Study Plan for the 200-BP-1 Prototype Surface Barrier (DOE-RL 1993a) was completed to gain performance and constructability data. Data collected from this treatability test will be used for design and construction of the final remedial action for the remaining waste management unit within the 200-BP-1 Operable Unit.

84 (DOE/RL-94-77) Tritiated wastewater treatment and disposal evaluation for 1994. Department of Energy, Richland, WA (United States). Richland Operations Office. Aug 1994. 78p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94019059. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses and analyzes information and issues regarding tritium and tritium management. It was prepared in response to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-26-05A for the evaluation of tritiated wastewater treatment and disposal. The key elements of the report are summarized as follows: Discharge of tritiated water is regulated worldwide. Differences exist in discharge limits and in regulatory philosophy from country to country and from state to state in the United States. Tritium from manmade sources is emitted into the atmosphere and discharged into the ground or directly to the oceans and to waterways that empty into the oceans. In 1989, reported worldwide emissions of tritium from nuclear power generating plants totaled almost 1,000,000 Curies (Ci).

85 (DOE/RL-94-104-Draft-A) Description of work vadose drilling at the 1301-N and 1325-N facilities, 100-NR-1 operable unit. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1994. 42p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007977. Source: OSTI; NTIS; INIS; GPO Dep.

This description of work (DOW) details the field activities associated with the sampling of the vadose zone soils beneath the 1301-N and 1325-N cribs and trenches and will

serve as a field guide for those performing the work. These activities are undertaken pursuant to the Hanford Federal Facility Agreement and Consent Order (Ecology et al., 1994a) Milestone M-16-94-01H-TI and the June 30, 1994 Milestone Change Request M-16-94-02 (Ecology et al., 1994b). Three vadose zone borings, 1301-N-1, 1301-N-2, and 1325-N-1, will be constructed to investigate the vertical and horizontal distribution of radionuclide contamination in sediments beneath the cribs and trenches. The boreholes are also intended to intersect subsurface areas that may have been contaminated by dangerous wastes, i.e., metals, in effluent disposed during past operation of the facilities. This limited field investigation will provide data for the evaluation of remedial alternatives. Data from the investigation are expected to confirm that the cribs and trenches are high priority sites in the 100-NR-1 operable unit. Data, from the investigation will be used to evaluate alternatives for closure of the 1301-N and 1325-N sites. The contaminants of potential concern (COPCs) for the 1301-N/1325-N limited field investigation are presented in Table 1.

86 (DOE/RL-94-132-Draft-A) Letter report for modeling evaluation of N-Springs barrier and pump-and-treat systems. Draft A. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008206. Source: OSTI; NTIS; INIS; GPO Dep.

This report fulfills Milestone M-16-12C to supply "necessary documentation justifying barrier placement and location of extraction wells and discharge point(s)" (Part I) and to document the "results of pumping tests at three existing wells to evaluate strontium-90 (Sr) concentration response to pumping" (Part II). Two models were used to analyze the hydraulic effects of a proposed barrier to flow located between N-Springs and the Columbia River. A linear barrier of sheet pile was located and its impact on reducing ^{90}Sr seepage under and around it were simulated. Results indicate that a 2,000-ft barrier would reduce the release of ^{90}Sr to the river to 22% to 26% of no-action, while a 3,800-ft barrier would reduce the release to 0% to 2% of no-action. Gaps in the wall's length would significantly degrade its performance, particularly if such gaps occur in the higher contamination zones. Simulations also demonstrated the need to anchor the sheet piling into or at the underlying clayey unit. Anchoring 2 ft above the underlying unit would degrade the overall performance of the Wall by approximately 11 %. Pump-and-treat options were not shown to significantly improve the protection of the river afforded by the barrier alone due to the affinity of ^{90}Sr for soil over water. The following table represents a summary of the model results.

87 (EGG-ER-11005) Idaho National Engineering Laboratory analytical services performance evaluation plan. Connolly, J.M.; Sailer, S.J.; Anderson, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95008601. Source: OSTI; NTIS; GPO Dep.

The Idaho National Engineering Laboratory's (INEL's) Sample Management Office (SMO) conducts a Performance Evaluation Program that ensures that data of known quality are supplied by the analytical chemistry service organizations with which the INEL contracts. The Analytical Services Performance Evaluation Plan documents the routine monitoring and assessment of suppliers conducted by the SMO, and it describes the procedures that are followed to ensure

that suppliers meet all appropriate requirements. Because high-quality analytical support is vital to the success of DOE Environmental Management programs at the INEL, the performance of organizations providing these services must be routinely monitored and assessed. Analytical disciplines for which performance is monitored include metals, organics, radiochemical, and miscellaneous classical analysis methods.

88 (EGG-GEO-10797-Rev.2) GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2. Rood, A.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1994. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002006. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.

Multimedia exposure assessment of hazardous chemicals and radionuclides requires that all pathways of exposure be investigated. The GWSCREEN model was designed to perform initial screening calculations for groundwater pathway impacts resulting from the leaching of surficial and buried contamination at CERCLA sites identified as low probability hazard at the INEL. In Version 2.0, an additional model was added to calculate impacts to groundwater from the operation of a percolation pond. The model was designed to make best use of the data that would potentially be available. These data include the area and depth of contamination, sorptive properties and solubility limit of the contaminant, depth to aquifer, and the physical properties of the aquifer (porosity, velocity, and dispersivity). For the pond model, data on effluent flow rates and operation time are required. Model output includes the limiting soil concentration such that, after leaching and transport to the aquifer, regulatory contaminant levels in groundwater are not exceeded. Also, groundwater concentration as a function of time may be calculated. The model considers only drinking water consumption and does not include the transfer of contamination to food products due to irrigation with contaminated water. Radiological dose, carcinogenic risk, and the hazard quotient are calculated for the peak time using the user-defined input mass (or activity). Appendices contain sample problems and the source code listing.

89 (EGG-M-94112) Stormwater management at the ARID INEL. Walker, E.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9405126-4: EG&G GOCO environmental conference, Las Vegas, NV (United States), 10-12 May 1994). Order Number DE95005030. Source: OSTI; NTIS; INIS; GPO Dep.

NPDES stormwater permits are required for stormwater discharges to waters of the US (WUS). The Idaho National Engineering Laboratory (INEL) applied for coverage under a general NPDES stormwater permit because there is some potential for stormwater discharge to the Big Lost River System, which could infiltrate to groundwater. The main requirements of the permit are to prevent contaminants from coming into contact with stormwater and prevent contaminated stormwater from running off of facilities into WUS or groundwater. All INEL major facility areas have prepared and implemented stormwater pollution prevention plans (SWPPPs). The INEL also applied for coverage under a separate NPDES general permit for stormwater discharges

from construction sites. An INEL Generic SWPPP for construction activities was prepared and implemented for all construction projects at the INEL.

90 (EGG-WM-11250) A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory. Martian, P.; Magnuson, S.O. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 70p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002050. Source: OSTI; NTIS; INIS; GPO Dep.

Soil moisture monitoring data in the surficial sediments at the Subsurface Disposal Area (SDA) at the Idaho National Engineering Laboratory were used to calibrate two numerical infiltration models. The calibration was performed with the ultimate goal of providing a reliable estimate of hydraulic properties and infiltration amounts to be used in other modeling efforts. Two neutron probe access tubes and a tensiometer nest were monitored from 1986 to 1990 and again during 1993. The field measurements of moisture content and matrix potential inside the SDA were used as calibration data for the two locations. The two locations showed vastly different behavior, which was well captured in the models. The average root mean square error between simulated and measured moisture contents over the simulation period was 0.03 and 0.06 for the two locations. The hydraulic parameters resulting from the calibration compared favorably with laboratory and field scale estimates. The simulation results also provided the opportunity to partially explain infiltration and redistribution processes occurring at the SDA. The underlying fractured basalt appears to behave similar to a capillary barrier. This behavior inhibits moisture movement into the underlying basalts until moisture contents in the overlying silts approach saturation. As a result, a large proportion of recharge occurring at the SDA may be due to spring snowmelt, when the surficial sediments become nearly saturated. The results also indicated that a unit gradient boundary condition (free drainage due to gravity) at the bottom of the silts is not appropriate because of the very low relative hydraulic conductivity of the basalts. Finally, the amount of water moving into the SDA subsurface from spring snowmelt appears larger than cumulative snowfall, indicating that snow drifting due to local topography as well as current snow management practices may have a substantial influence on local infiltration.

91 (ES/ESH-20) Groundwater surveillance plan for the Oak Ridge Reservation. Forstrom, J.M. (Oak Ridge K-25 Site, TN (United States)); Smith, E.D.; Winters, S.L.; Haase, C.S.; King, H.L.; McMaster, W.M. Oak Ridge National Lab., TN (United States). Jul 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94018334. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division publication number 4123.

US Department of Energy (DOE) Order 5400.1 requires the preparation of environmental monitoring plans and implementation of environmental monitoring programs for all DOE facilities. The order identifies two distinct components of environmental monitoring, namely effluent monitoring and environmental surveillance. In general, effluent monitoring has the objectives of characterizing contaminants and demonstrating compliance with applicable standards and permit requirements, whereas environmental surveillance has the broader objective of monitoring the effects of DOE

activities on on- and off-site environmental and natural resources. The purpose of this document is to support the Environmental Monitoring Plan for the Oak Ridge Reservation (ORR) by describing the groundwater component of the environmental surveillance program for the DOE facilities on the ORR. The distinctions between groundwater effluent monitoring and groundwater surveillance have been defined in the Martin Marietta Energy Systems, Inc., Groundwater Surveillance Strategy. As defined in the strategy, a groundwater surveillance program consists of two parts, plant perimeter surveillance and off-site water well surveillance. This document identifies the sampling locations, parameters, and monitoring frequencies for both of these activities on and around the ORR and describes the rationale for the program design. The program was developed to meet the objectives of DOE Order 5400.1 and related requirements in DOE Order 5400.5 and to conform with DOE guidance on environmental surveillance and the Energy Systems Groundwater Surveillance Strategy.

92 (ESTSC-000808IB38600) FLOW. A Computer Program for Processing In Situ Permeable Flow Sensor Data. Ballard, S. (Sandia National Labs., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States). 1 Feb 1994. Sponsored by USDOE, Washington, DC (United States). Source: ESTSC.

Description: IBM PC 386; The software runs on computers rBorland Pascal v 7.0.; 1 3.5 Diskette. The executable file on the diskette which accompanies this submission is named FLOW.EXE. The source code for FLOW is contained in the 10 files which end with the .PAS extension. The four files which end with .TPU and .TPP are compiled versions of object modules provided by Borland and which are required in order to compile FLOW.

This software is used to interpret data from the In Situ Permeable Flow Sensor, a device which uses a thermal perturbation technique to directly measure the magnitude and direction of the full 3 dimensional groundwater flow velocity vector in permeable geologic media. It accepts as input the temperature data acquired from a flow sensor and performs an inversion to calculate the set of groundwater flow parameters which best fits the data. It possesses capabilities to graphically display the flow sensor.

93 (FEMP/SUB-058) Uranium soils integrated demonstration: Soil characterization project report. Cunnane, J.C. (Argonne National Lab., IL (United States)); Gill, V.R.; Lee, S.Y.; Morris, D.E.; Nickelson, M.D.; Perry, D.L.; Tidwell, V.C. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States); Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States). Aug 1993. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. Order Number DE94018442. Source: OSTI; NTIS; INIS; GPO Dep.

An Integrated Demonstration Program, hosted by the Fernald Environmental Management Project (FEMP), has been established for investigating technologies applicable to the characterization and remediation of soils contaminated with uranium. Critical to the design of relevant treatment technologies is detailed information on the chemical and physical characteristics of the uranium waste-form. To address this need a soil sampling and characterization program was initiated which makes use of a variety of standard analytical techniques coupled with state-of-the-art microscopy and spectroscopy techniques. Sample representativeness is evaluated through the development of

conceptual models in an effort to identify and understand those geochemical processes governing the behavior of uranium in FEMP soils. Many of the initial results have significant implications for the design of soil treatment technologies for application at the FEMP.

94 (LA-12733-MS-Vol.1) Source document compilation: Los Alamos Investigations related to the environment, engineering, geology, and hydrology, 1961-1990: Volume 1. Purtymun, W.D. (comp.). Los Alamos National Lab., NM (United States). Mar 1994. 351p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94010685. Source: OSTI; NTIS; GPO Dep.

This document is a compilation of informal reports, letters, and memorandums regarding geologic and hydrologic studies and investigations such as foundation investigations for structures, drilling or coring for environmental studies, development of water supply, or construction of test or observation wells for monitoring. Also included are replies requested for specific environmental, engineering, geologic, and hydrologic problems. The purpose of this document is to preserve and make the original data available to the environmental studies that are now in progress at Los Alamos and provide a reference for and supplement the LAMS report "Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface water stations at Los Alamos: with Reference to the Geology and Hydrology," which is in preparation. The informal reports and memorandums are listed chronologically from December 1961 to January 1990. Item 208 is a descriptive history of the US Geological Survey's activities at Los Alamos from 1946 through 1972. The history includes a list of published and unpublished reports that cover geology, hydrology, water supply, waste disposal, and environmental monitoring in the Los Alamos area.

95 (LA-12733-MS-Vol.2) Source document compilation: Los Alamos Investigations related to the environment, engineering, geology, and hydrology, 1961-1990: Volume 2. Purtymun, W.D. (comp.). Los Alamos National Lab., NM (United States). Mar 1994. 346p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94010686. Source: OSTI; NTIS; GPO Dep.

This document is a compilation of informal reports, letters, and memorandums regarding geologic and hydrologic studies and investigations such as foundation investigations for structures, drilling or coring for environmental studies, development of water supply, or construction of test or observation wells for monitoring. Also included are replies requested for specific environmental, engineering, geologic, and hydrologic problems. The purpose of this document is to preserve and make the original data available to the environmental studies that are now in progress at Los Alamos and provide a reference for and supplement the LAMS report "Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface water stations at Los Alamos: with Reference to the Geology and Hydrology," which is in preparation. The informal reports and memorandums are listed chronologically from December 1961 to January 1990. Item 208 is a descriptive history of the US Geological Survey's activities at Los Alamos from 1946 through 1972. The history includes a list of published and unpublished reports that cover geology, hydrology, water supply, waste disposal, and environmental monitoring in the Los Alamos area.

96 (LA-12799-PR) Determining uranium speciation in Fernald soils by molecular spectroscopic methods: FY 1993 progress report. Allen, P.G.; Berg, J.M.; Crisholm-Brause, C.J.; Conradson, S.D.; Donohoe, R.J.; Morris, D.E.; Musgrave, J.A.; Tait, C.D. Los Alamos National Lab., NM (United States). Jul 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94013979. Source: OSTI; NTIS; INIS; GPO Dep.

This progress report describes new experimental results and interpretations for data collected from October 1, 1992, through September 30, 1993, as part of the Characterization Task of the Uranium in Soils Integrated Demonstration of the Office of Technology Development, Office of Environmental Restoration and Waste Management of the US Department of Energy. X-ray absorption, optical luminescence, and Raman vibrational spectroscopies were used to determine uranium speciation in contaminated soils from the US DOE's former uranium production facility at Fernald, Ohio. These analyses were carried out both before and after application of one of the various decontamination technologies being developed within the Integrated Demonstration. This year the program focused on characterization of the uranium speciation remaining in the soils after decontamination treatment. X-ray absorption and optical luminescence spectroscopic data were collected for approximately 40 Fernald soil samples, which were treated by one or more of the decontamination technologies.

97 (LA-12831-MS) Calibration of neutron moisture gauges and their ability to spatially determine soil water content in environmental studies. Nyhan, J.W.; Martinez, J.L.; Langhorst, G.J. Los Alamos National Lab., NM (United States). Oct 1994. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006074. Source: OSTI; NTIS; INIS; GPO Dep.

Several neutron moisture gauges were calibrated, and their ability to spatially determine soil water content was evaluated. In 1982, the midpoint of sensitivity of each neutron probe to the detection of hydrogen was determined, as well as the radius of investigation of each probe in crushed Bandelier Tuff with varying water contents. After determining the response of one of the moisture gauges to changes in soil water at the soil-air interface, a neutron transport model was successfully calibrated to predict spatial variations in soil water content. The model was then used to predict various shapes and volumes of crushed Bandelier Tuff interrogated by the neutron moisture gauge. From 1991 through 1994, six neutron moisture gauges were calibrated for soil water determinations in a local topsoil and crushed Bandelier Tuff, as well as for a sample of fine sand and soils from a field experiment at Hill Air Force Base. Statistical analysis of the calibration results is presented and summarized, and a final summary of practical implications for future neutron moisture gauge studies at Los Alamos is included.

98 (LA-12861-MS) A compendium of results from long-range alpha detector soil surface monitoring: June 1992-May 1994. Garner, S.E. (Los Alamos National Lab., NM (United States)); Bounds, J.A.; Allander, K.S.; Johnson, J.D.; MacArthur, D.W.; Caress, R.W. Los Alamos National Lab., NM (United States). Nov 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95004230. Source: OSTI; NTIS; INIS; GPO Dep.

Soil surface monitors based on long-range alpha detector (LRAD) technology are being used to monitor alpha contamination at various sites in the Department of Energy complex. These monitors, the large soil-surface monitor (LSSM) and the small soil-surface monitor (SSSM), were used to help characterize sites at Fernald, Ohio, and active or inactive firing sites at Sandia National Laboratories and Los Alamos National Laboratory. Monitoring results are presented herein in chronological order.

99 (LA-12883-MS) Geologic and hydrologic records of observation wells, test holes, test wells, supply wells, springs, and surface water stations in the Los Alamos area. Purtymun, W.D. Los Alamos National Lab., NM (United States). Jan 1995. 339p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007637. Source: OSTI; NTIS; INIS; GPO Dep.

Hundreds of holes have been drilled into the Pajarito Plateau and surrounding test areas of the Los Alamos National Laboratory since the end of World War II. They range in depth from a few feet to more than 14,000 ft. The holes were drilled to provide geologic, hydrologic, and engineering information related to development of a water supply, to provide data on the likelihood or presence of subsurface contamination from hazardous and nuclear materials, and for engineering design for construction. The data contained in this report provide a basis for further investigations into the consequences of our past, present, and future interactions with the environment.

100 (LA-SUB-94-18) Barriers and post closure monitoring: Final report. Kovarik, F.S. (Univ. of Houston, TX (United States). Institute for Improved Oil Recovery); Killough, J.; Mohanty, K.; Rajagopalan, R. Los Alamos National Lab., NM (United States). Apr 1993. 206p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94019164. Source: OSTI; NTIS; INIS; GPO Dep.

A feasibility study (Phase I) was performed investigating the application of chemical gels used for profile control in the petroleum industry to zone isolation and the in situ clean up of hazardous waste. The transfer and application of petroleum technology to serious environmental problems facing the US could not only reduce remediation costs to a small fraction of that incurred with existing barrier containment methods, but these techniques can be adapted to isolate blocks or zones in a manner not currently feasible. DuPont and Pfizer were the industry collaborators on this project, and supplied gel materials as well as technical guidance and support. This study investigated "worst case" scenarios. A detailed review of chemical gels used for profile control in petroleum applications was assembled and included information on how gel systems can be used as model compounds in hazardous waste containment. Example data are presented to provide insight into the physical characteristics of gel systems. IOR collaborated with LANL personnel on the design and implementation of field scale barrier experiments, and on the design of laboratory experiments that characterize barrier systems. Chemical gel barrier systems used at the LANL field test were characterized at their original composition. Composite barriers using DuPont LUDOX SM® colloidal silica gel, zeolite and sand and Pfizer FLOPAAM 1330S® hydrolyzed polyacrylamide (HPAM) gel, peat, bentonite and sand were unconsolidated. A barrier consisting of LUDOX and sand was semi-consolidated. This study indicates that X-ray Computed Tomography (CT)

Scanning and Environmental Scanning Electron Microscopy (ESEM) can be used successfully to study the structure, stability and transport properties of barrier systems.

101 (LA-SUB-94-88) A cost-effectiveness analysis of the in situ air stripping technology at the Savannah River Integrated Demonstration site: Part 1 and Part 2. Brill, T.C.; Brookshire, D.S.; McKee, M. New Mexico Univ., Albuquerque, NM (United States). Dept. of Economics. Jan 1994. 179p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94015419. Source: OSTI; NTIS; INIS; GPO Dep.

This study reports on an evaluation of a proposed new technology for remediating existing groundwater contamination. Two tasks are undertaken in this report. The first is a conventional cost-effectiveness analysis of the new technology versus existing technologies. In this evaluation several issues are addressed such as the choice of the metric used in the cost-effectiveness analysis, the time period of the evaluation, the appropriate discount rate, and the assumptions used for extrapolation of the field data. The second task is the extension of the conventional cost-effectiveness analysis to incorporate a decision analysis framework. This extension revolves many issues raised in conducting cost-effectiveness analysis of complex technologies. It allows inclusion of physical modeling, in this case groundwater modeling, to augment the limited field data and to analyzed different implementations of the technology. This study evaluates the performance of the new technology, in situ air stripping (ISAS), as compared with a conventional technology that involves the joint use of pump and treat with soil vapor extraction (PT-SVE) using vertical wells.

102 (LA-SUB-94-154) An assessment of Microtox™ as a biomonitoring tool for whole effluent testing for Los Alamos National Laboratory. Zachritz, W.H. II (New Mexico State Univ., Las Cruces, NM (United States)); Morrow, J. Los Alamos National Lab., NM (United States); New Mexico State Univ., Las Cruces, NM (United States). 13 Jun 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95003457. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory (LANL) has special discharge problems relating to potential radioactive content of the effluent discharge waters. Because of this all testing must be performed on-site and results must be rapidly determined. There is a need to examine the development of a real-time procedure for effluent biomonitoring to met these site limitations. The Microtox™ unit for toxicity testing is a microbially-based test system that shows great promise to be used for WET testing. The overall goal of this study is to develop an acceptable protocol for operational biomonitoring using the Microtox™ toxicity test for LANL. The specific objectives include: development of an appropriate toxicity testing protocol using the Microtox™ toxicity test for whole effluent toxicity testing and evaluation of the protocol based on factors such as sensitivity, response time, cost of analysis, and simplicity of operation.

103 (LA-SUB-95-25) Laboratory analysis of soil hydraulic properties of CDBM 2 and CDBM 3 samples. Los Alamos National Lab., NM (United States). Dec 1992. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007641. Source: OSTI; NTIS; GPO Dep.

Daniel B. Stephens & Associates, Inc. (DBS&A) was requested by Dr. Alan Stoker of Los Alamos National Laboratory to perform laboratory analysis for properties of CDBM 2 and CDBM 3 samples, as outlined in Subcontract No. 9-XTI-027EE-1. The scope of work included conducting tests for the following properties: Initial moisture content, dry bulk density, and calculated porosity; Saturated hydraulic conductivity; Moisture characteristics; Unsaturated hydraulic properties (calculated); and Transient outflow.

104 (LA-SUB-95-26) Field investigations of soils at TA-19, TA-26, TA-73 and TA-0, SWMU aggregate 0-D and 016. McFadden, L.D. (Geoprofile, Inc., Albuquerque, NM (United States)). Los Alamos National Lab., NM (United States); Geoprofile, Inc., Albuquerque, NM (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007642. Source: OSTI; NTIS; INIS; GPO Dep.

Field based investigations of the general soil-geomorphic characteristics were carried out at TA-19, -26, -73, -0, Aggregate 0-D and -016 in order to provide information for utilization in ongoing and anticipated LANL ERP (Environmental Restoration Project) activities at these sites. These investigations show that soils exhibiting diverse morphologic character, varying ages, and relations to landforms characterize these sites. A review of recent and ongoing soils studies also shows that soil textural, chemical, and mineralogical characteristics may profoundly influence the migration and/or retardation of a variety of potential contaminants initially placed in direct contact with soils, or that encounter soils during subsurface percolation or discharge. Soil-geomorphic relations also provide important insights into recent site erosion, deposition or other surficial processes that must, be considered as part of environmental assessment of a given site and remediation; and, the planned geomorphic mapping activities at each site, as well as other associated activities (e.g., geophysical survey, site sampling) are accordingly appropriate and necessary with respect to identification of significant soil relations at each site. Specific and general recommendations in consideration of important findings regarding the possible impacts of soil development of the nature of contaminant behavior at various sites are provided to help guide sampling and analysis activities during ERP investigations outlined in the RFI Work Plan for Operational Unit-1071.

105 (LA-UR-94-1946) Alpha detection as a probe for counter proliferation. Koster, J.E.; Johnson, J.P.; MacArthur, D.W.; Walters, S.G. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410105-6: Institute of Electrical and Electronics Engineers international Carnahan conference on security technology, Albuquerque, NM (United States), 12-14 Oct 1994). Order Number DE94014435. Source: OSTI; NTIS; GPO Dep.

An indication of the presence of special nuclear material (SNM) can be obtained by the detection of alpha particles from the decay of the SNM. Current techniques for detecting alpha particles have a number of limitations. Sensitive conventional detection of SNM traces involves off-site laboratory analysis – but at the loss of an on-site confirmation. Fieldable detection instruments, on the other hand, are delicate and have poor sensitivity. New long-range alpha detection (LRAD) technology mitigates these limitations. An LRAD-based instrument relies on the detection of the hundreds of thousands of ions produced in ambient air by one

emitted alpha particle. The ions can be transported to an ion detector at a distance much greater than the range of the original alpha particle. The LRAD-based monitors have the characteristics of high sensitivity, fast (real-time) response, ruggedness, and reliability. Many of the designs are quite portable. In this paper, several scenarios are identified for which particular LRAD-based detectors can provide confirmation of proliferation activity.

106 (LA-UR-94-2418) Practical alpha detectors for site characterization. Bounds, J.A.; Allander, K.S.; Bolton, R.B.; Garner, S.E.; Johnson, J.D.; Johnson, J.P.; MacArthur, D.W.; Sprouse, L.L.; Walters, S.G. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940815-72: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94016292. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have and are developing a series of practical alpha detectors for alpha characterization. These include soil surface monitors, pipe and duct monitors, air quality and radon monitors, tool monitors, and sample monitors. Two types of these monitors have been transferred to industry thus far for commercialization. Several of these systems have been fully field tested: for example, the soil surface monitor has been used to characterize 11 sites for 7 customers at 3 DOE facilities. Using a new but simple technology, these alpha detectors can be put to use in many areas where conventional alpha probes are impractical or insufficiently sensitive. Use of these alpha detectors in site characterization at the Uranium in Soil Integrated Demonstration at Fernald, at Los Alamos, and elsewhere will be discussed as well as their commercialization and possible further applications.

107 (LA-UR-94-2830) Simulating the Upper Barren Zone and the Ore Zone tests performed with the EMC logging tool. Frankle, S.C. Los Alamos National Lab., NM (United States). [1994]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94018286. Source: OSTI; NTIS; INIS; GPO Dep.

The primary purpose of the Multispectral Nuclear Logging project is to assess the effectiveness of applying nuclear borehole-logging techniques to the Department of Energy's (DOE) Environmental Restoration (ER) program, adapt the technology to improve these capabilities, and transfer that technology to industry. The purpose of the Monte Carlo simulations using MCNP is to predict the minimum concentration levels for environmental contaminants that could be detected by Multispectral Logging (MSL). The Monte Carlo code used for this type of simulation, MCNP, should be benchmarked against experimental data to show that the user can accurately reproduce the proper gamma-ray spectrum. Experimental data was obtained from Westinghouse-Hanford Company using the Environmental Measurements Corp. (EMC) logging tool in the Upper Barren Zone (UBZ) and Ore Zone (OZ) calibration models at Grand Junction. This paper continues the discussion of benchmarking MCNP using the UBZ and OZ data.

108 (LA-UR-94-3114) Technology information profile: Long-Range Alpha Detector (LRAD). Bounds, J.A. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract W-7405-ENG-36. Order Number DE95006448. Source: OSTI; NTIS; INIS; GPO Dep.

The idea to develop some sort of radiation detection using this knowledge was passed down and after extensive and ground-breaking development, practical and sensitive devices were invented that are particularly sensitive to alpha radiation. Well over twenty different LRAD detectors have been successfully built and plans exist for many more. No parallel work is known to exist, and the ability to detect alpha radiation at such distances is unequalled.

109 (LA-UR-94-3120) Barriers and post-closure monitoring (AL121125). Bostick, K.V.; Janecky, D. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006449. Source: OSTI; NTIS; INIS; GPO Dep.

This project focuses on the rapid implementation of near-surface barriers, biotreatment, and post-closure monitoring technology. It uses water-permeable and biologic barriers that chemically capture and/or degrade contaminants without significantly altering the natural water flow regime. Barrier approaches are being tested for two different applications. The first is the use of barriers for confinement of chemical contaminants for in-trench treatments with leach systems or an in-place bioreactor. The second is an enhancement of the current practice of emplacing grout or clay slurry walls into direct horizontal surface and subsurface water flows around a contaminated area by integrating permeable reactive barriers and petroleum reservoir gel/foam/polymer technology.

110 (LA-UR-94-3632) Field study of alpha characterization of a D&D site using long-range alpha detectors. Rawool-Sullivan, M.W.; Allander, K.S.; Bounds, J.A.; Koster, J.E.; MacArthur, D.W.; Sprouse, L.L.; Stout, D.; Vaccarella, J.A.; Vu, T.Q. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-34: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95002731. Source: OSTI; NTIS; INIS; GPO Dep.

A successful and cost-effective D&D effort relies upon an accurate, real-time, in situ, and non-destructive method of characterization of contamination both before and after the decontamination process. Detector systems based on long-range alpha detection (LRAD) technology meet these criteria. Currently, LANL is in the process of investigating, designing, or building various surface monitors, various pipe monitors, and glove-box monitors. This paper describes the field studies conducted using detectors based on LRAD technology.

111 (LA-UR-94-3633) Alpha detection for characterization of D&D sites. MacArthur, D.W.; Allander, K.S.; Bolton, R.D.; Koster, J.; Rawool-Sullivan, M.; Rojas, S.; Sprouse, L. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-33: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95002730. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of radioactive contaminants is required during D&D operations at any facility where radioactivity is suspected or known to exist. Alpha radiation is an excellent indicator of the presence of many isotopes (such as Pu²³⁹) which are otherwise difficult to observe. However, traditional

fieldable alpha detectors have been hampered by the short range of alpha particles in air and in detector windows. We have developed an alpha detection technology that avoids the problems mentioned above. In a monitor using the long-range alpha detector (LRAD) technology, we detect the ion pairs produced by an alpha particle's interaction with air rather than the particles themselves. In this paper, we discuss several applications to air and soil monitoring as well as potentially contaminated building surfaces and process equipment.

112 (LA-UR-94-3685) A brief review of environmental transport of tritium at the Los Alamos LLRW disposal facility. Vold, E.L. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941214-1: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95002699. Source: OSTI; NTIS; INIS; GPO Dep.

A large data base of tritium in the environmental the Los Alamos National Laboratory LLRW disposal facility, Area G, is summarized. Tritium in surface and subsurface soil moisture indicates three disposal areas significantly elevated above background with the highest results around the currently used tritium disposal shafts. Airborne concentrations are well below appropriate concentration guidelines but vary seasonally by over an order of magnitude. Surface efflux measurements show seasonal and diurnal time dependent variations with a positive correlation with ambient temperature. The integral of the surface efflux is estimated as a release on the order of ten Curies/year. A subsurface tritium plume observed in the early seventies has since been greatly reduced indicating an effective half-life in the environment which is significantly shorter than the radiologic half-life. Subsurface migration from the mesa top disposal facility has resulted in tritium in the canyon water immediately adjacent to the disposal site which is marginally elevated above background. The hydrogeologic diffusion near the tritium shafts is compared to model results to predict the vertical extent of the tritium migration. Field work to define this limit and additional quantification of tritium sources and migration is continuing.

113 (LA-UR-95-410) A real-time alpha monitoring system for radioactive liquid waste. Johnson, J.D.; Bond, A.W.; Bounds, J.A.; Hanson, S.W.; MacArthur, D.W.; Moss, W.D.; Rawool-Sullivan, M.W.; Sprouse, L.L.; Williams, H.E. III. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-43: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006286. Source: OSTI; NTIS; INIS; GPO Dep.

A real-time monitor for radioactive liquid waste is being developed at Los Alamos National Laboratory (LANL). This detector system is designed to monitor for large changes in alpha activity in a liquid waste stream. The detector is unique in that it monitors the ionization created by alpha interactions with air, using long-range alpha detector (LRAD) technology. This is a non-intrusive method that can be used in various complicated geometries. This technique only allows for the monitoring of the surface of the liquid, however, preliminary tests indicate that the technique should allow for real-time, sensitive monitoring of a well-mixed liquid waste stream. This technique will require further research and development, but the final system should be an inexpensive

detector system for segregating and monitoring radioactive liquids at national laboratories, processing facilities, and nuclear power plants.

114 (LA-UR-95-698) In situ bioremediation: Cost effectiveness of a remediation technology field tested at the Savannah River. Saaty, R.P.; Showalter, W.E.; Booth, S.R. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-73: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95007849. Source: OSTI; NTIS; INIS; GPO Dep.

In Situ Bioremediation (ISBR) is an innovative new remediation technology for the removal of chlorinated solvents from contaminated soils and groundwater. The principal contaminant at the SRID is the volatile organic compound (VOC), trichloroethylene (TCE). A 384 day test run at Savannah River, sponsored by the US Department of Energy, Office of Technology Development (EM-50), furnished information about the performance and applications of ISBR. In Situ Bioremediation, as tested, is based on two distinct processes occurring simultaneously; the physical process of in situ air stripping and the biological process of bioremediation. Both processes have the potential to remediate some amount of contamination. A quantity of VOCs, directly measured from the extracted air stream, was removed from the test area by the physical process of air stripping. The biological process is difficult to examine. However, the results of several tests performed at the SRID and independent numerical modeling determined that the biological process remediated an additional 40% above the physical process. Given this data, the cost effectiveness of this new technology can be evaluated.

115 (LA-UR-95-748) Cost-effectiveness analysis of the SEAMIST™ membrane system technology. Henriksen, A.D.; Booth, S.R. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-39: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95007832. Source: OSTI; NTIS; INIS; GPO Dep.

SEAMIST™ is a new technology that consists of an air-tight membrane liner that is pneumatically emplaced inside the borehole. The positive air pressure inside the liner maintains the integrity of the borehole structure. Sampling ports with attached tubing, absorbent collectors, or various in situ measuring devices can be fabricated into the liner and used for monitoring volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, herbicides, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, or radioactive substances. In addition, small instruments can be guided through the lined borehole and measurements taken inside at specified intervals. The purpose of this study is to analyze the cost and performance effectiveness of this new technology. To do so, the authors constructed five hypothetical scenarios in which utilization of the SEAMIST™ system can address various needs of the Department of Energy's environmental remediation program. Two of the scenarios involve vertical boreholes (or vertical instrument configurations) and two involve horizontal boreholes (or horizontal instrument configurations). The four scenarios jointly address contamination by VOCs, SVOCs, various water-soluble toxic substances, and low-level radioactive waste. One of the scenarios involves towing an instrument through a borehole and taking measurements of moisture levels in the surrounding soil.

116 (LBL-35134) On the validity of a Fickian diffusion model for the spreading of liquid infiltration plumes in partially saturated heterogeneous media. Pruess, K. Lawrence Berkeley Lab., CA (United States). Jan 1994. 8p. Sponsored by USDOE, Washington, DC (United States); Swiss National Cooperative for the Storage of Nuclear Waste, Baden (Switzerland). DOE Contract AC03-76SF00098. (CONF-940742-6: Computational methods in water resources, Heidelberg (Germany), 19-22 Jul 1994). Order Number DE94011352. Source: OSTI; NTIS; INIS; GPO Dep.

Localized infiltration of aqueous and -non-aqueous phase liquids (NAPLs) occurs in many circumstances. Examples include leaky underground pipelines and storage tanks, landfill and disposal sites, and surface spills. Because of ever-present heterogeneities on different scales such infiltration plumes are expected to disperse transversally and longitudinally. This paper examines recent suggestions that liquid plumes are being dispersed from medium heterogeneities in a manner that is analogous to Fickian diffusion. Numerical simulation experiments on liquid infiltration in heterogeneous media are performed to study the dispersive effects of small-scale heterogeneity. It is found that plume spreading indeed tends to be diffusive. Our results suggest that, as far as infiltration of liquids is concerned, broad classes of heterogeneous media behave as dispersive media with locally homogeneous (albeit anisotropic) permeability.

117 (LBL-35186) Phenomenological studies of two-phase flow processes for nuclear waste isolation. Pruess, K.; Finsterle, S.; Persoff, P.; Oldenburg, C. Lawrence Berkeley Lab., CA (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States); Swiss National Cooperative for the Storage of Nuclear Waste, Baden (Switzerland). DOE Contract AC03-76SF00098. (CONF-940553-47: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94011350. Source: OSTI; NTIS; INIS; GPO Dep.

The US civilian radioactive waste management program is unique in its focus on a site in the unsaturated zone, at Yucca Mountain, Nevada. Two-phase flow phenomena can also play an important role in repositories beneath the water table where gas is generated by corrosion, hydrolysis, and biological degradation of the waste packages. An integrated program has been initiated to enhance our understanding of two-phase flow behavior in fractured rock masses. The studies include two-phase (gas-liquid) flow experiments in laboratory specimens of natural rock fractures, analysis and modeling of heterogeneity and instability effects in two-phase flow, and design and interpretation of field experiments by means of numerical simulation. We present results that identify important aspects of two-phase flow behavior on different space and time scales which are relevant to nuclear waste disposal in both unsaturated and saturated formations.

118 (LBL-35312) A code to computer borehole temperature profiles under steady flow conditions. Hale, F.V.; Tsang, C.F. Lawrence Berkeley Lab., CA (United States). Feb 1994. 35p. Sponsored by USDOE, Washington, DC (United States); Swiss National Cooperative for the Storage of Nuclear Waste, Baden (Switzerland). DOE Contract AC03-76SF00098. Order Number DE94011010. Source: OSTI; NTIS; GPO Dep.

If an uncased section of a wellbore intersects a number of flowing fractures or permeable layers containing fluids with

different temperatures, it may be possible to use temperature logs of the wellbore fluid in order to obtain information about the hydraulic properties of the geological formation. One possible method is to first flush the wellbore with water of a known temperature and then pump the well at a small, constant flow rate. During pumping a number of logging runs are made, and distinctive features in the logs develop as fluid from each inflow point enters the wellbore. Section 2 of this report describes the analytical and numerical solutions to the governing equations. Section 3 presents a brief discussion of the FORTRAN code Borettemp which incorporates the numerical solution. Section 4 describes the input and output files for the code, and Section 5 contains verification cases and examples.

119 (LBL-35569) New barrier fluids for subsurface containment of contaminants. Moridis, G.J.; Persoff, P.; Holman, H.Y.; Muller, S.J.; Pruess, K.; Radke, C.J. Lawrence Berkeley Lab., CA (United States). Oct 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-931095-87: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE95006581. Source: OSTI; NTIS; GPO Dep.

In some situations, containment of contaminants in the subsurface may be preferable to removal or treatment in situ. In these cases, it may be possible to form barriers by injecting fluids (grouts) that set in place and reduce the formation permeability. This paper reports laboratory work to develop two types of fluids for this application: colloidal silica (CS) and polysiloxane (PSX). Falling-head permeameter tests of grouted Hanford sand, lasting 50 days, showed hydraulic conductivities of order 10^{-7} cm/sec for these two materials. Low initial viscosity of the grout is necessary to permit injection without causing fracturing or surface uplift. Experiments with crosslinked polysiloxanes showed that they could be diluted to achieve adequately low viscosity without losing their ability to cure. Control of the gel time is important for grout emplacement. Gel time of CS grouts increased with increasing pH (above 6.5) and with decreasing ionic strength. Salt solutions were added to the colloid to increase the ionic strength and control gel time. When injected into Hanford sand, the CS grout gelled much more quickly than the same formula without sand. This effect results from salinity that is present in pore water and from multi-valent ions that are desorbed from clays and ion-exchanged for mono-valent ions in the grout. Ion-exchange experiments showed that most of the multi-valent ions could be removed by flushing the sand with 15 PV of 4% NaCl and sand treated in this manner did not accelerate the gelling of the grout. When grout is injected into unsaturated soil it slumps, leaving the soil only partially saturated and achieving less permeability reduction upon gelling. Multiple injections of CS grout in 1-D sand columns demonstrated that by accumulating the residual gelled grout saturations from several injections, low permeability can be achieved.

120 (LBL-36086) A TOUGH2 equation-of-state module for the simulation of two-phase flow of air, water, and a miscible gelling liquid. Finsterle, S. (Lawrence Berkeley Lab., CA (United States). Earth Sciences Div.); Moridis, G.J.; Pruess, K. Lawrence Berkeley Lab., CA (United States). May 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95004816. Source: OSTI; NTIS (documentation only); ESTSC (complete software

package), P.O. Box 1020, Oak Ridge, TN 37831-1020; GPO Dep.

The injection of grout into the subsurface can be used to encapsulate contaminated regions of an aquifer, or to form underground barriers for the isolation of contaminant sources and to prevent the spreading of existing plumes. This requires identifying grouts, or barrier fluids, which when injected into the subsurface exhibit a large increase in viscosity and eventually solidify, sealing the permeable zones in the aquifer. Simulation and modeling analysis are indispensable tools for designing the injection and predicting the performance of the barrier. In order to model flow and transport in such systems, the thermophysical properties of the fluid mixtures have to be provided, and the governing mass- and energy-balance equations for multiphase flow in porous media have to be solved numerically. The equation-of-state module EOS11 described herein is an extension of the EOS7 module of the TOUGH2 code for flow of saline water and air. In the modeling approach, the chemical grout is treated as a miscible fluid the viscosity of which is a function of time and concentration of the gelling agent in the pore water. If a certain high viscosity is reached and the movement of the grout plume ceases, the gel is assumed to solidify, leading to a new porous medium with changed soil characteristics, i.e. reduced porosity and permeability, increased capillary strength for a given water content, and changed initial saturation distribution.

121 (LBL-36088) Optimizing multiphase aquifer remediation using ITOUGH2. Finsterle, S. (Lawrence Berkeley Lab., CA (United States). Earth Sciences Div.); Pruess, K. Lawrence Berkeley Lab., CA (United States). Jun 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95004817. Source: OSTI; NTIS; GPO Dep.

The T2VOC computer model for simulating the transport of organic chemical contaminants in non-isothermal multiphase systems has been coupled to the ITOUGH2 code which solves parameter optimization problems. This allows one to use nonlinear programming and simulated annealing techniques to solve groundwater management problems, i.e. the optimization of multiphase aquifer remediation. This report contains three illustrative examples to demonstrate the optimization of remediation operations by means of simulation-minimization techniques. The code iteratively determines an optimal remediation strategy (e.g. pumping schedule) which minimizes, for instance, pumping and energy costs, the time for cleanup, and residual contamination. While minimizing the objective function is straightforward, the relative weighting of different performance measures—e.g. pumping costs versus cleanup time versus residual contaminant content—is subject to a management decision process. The intended audience of this report is someone who is familiar with numerical modeling of multiphase flow of contaminants, and who might actually use T2VOC in conjunction with ITOUGH2 to optimize the design of aquifer remediation operations.

122 (ORNL/ER-22) Groundwater quality monitoring well installation for waste area grouping 7 and solid waste storage area 1, Oak Ridge, Tennessee. Mortimore, J.A.; Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 456p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003257. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to document the drilling and installation of the groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 7 and at Solid Waste Storage Area (SWSA) 1, which is a part of WAG 1. Installation of GQM wells was required at Oak Ridge National Laboratory (ORNL) for regulatory compliance. Data obtained from these wells will be used to characterize and assess groundwater quality at the perimeter of each WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The wells in WAG 7 and SWSA 1 were drilled and developed during the period from June 1989 to March 1990.

123 (ORNL/ER-26) Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 472p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002290. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of 22 groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 5. WAG 5 is located south of the Oak Ridge National Laboratory main plant area in Melton Valley and includes 33 solid waste management units. The wells at WAG 5 were drilled and developed between July 1987 and March 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 5. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

124 (ORNL/ER-68) Groundwater quality monitoring well installation for Lower Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program. Mortimore, J.A.; Lee, T.A. Oak Ridge National Lab., TN (United States). Sep 1994. 263p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002289. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of 11 groundwater quality monitoring (GQM) wells on the perimeter of Lower Waste Area Grouping (WAG) 2. Lower WAG 2 consists of White Oak Lake and the embayment below White Oak Dam above the Clinch River. The wells in Lower WAG 2 were drilled and developed between December 1989 and September 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The wells at Lower WAG 2 were drilled with auger or air rotary rigs. Depending on the hydrogeologic conditions present at each proposed well location, one of three basic installation methods was utilized. Detailed procedures for well construction were specified by the Engineering Division to ensure that the wells would provide water samples representative of the

aquifer. To ensure conformance with the specifications, Energy Systems Construction Engineering and ERCE provided continuous oversight of field activities. The purpose of the well installation program was to install GQM wells for groundwater characterization at Lower WAG 2. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

125 (ORNL/ER-69) Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Lee, T.A. Oak Ridge National Lab., TN (United States). Sep 1994. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002291. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of seven groundwater quality monitoring (GQM) wells on the perimeter of Upper Waste Area Grouping (WAG) 2. Upper WAG 2 is composed of portions of White Oak Creek (WOC), Melton Branch, two of Melton Branch's tributaries, and the floodplains surrounding these water bodies. The WOC section of the subject site begins at the confluence of WOC and Melton Branch and extends 0.62 mile upstream to the 7,500 bridge. The Melton Branch portion of the site also begins at the confluence of WOC and Melton Branch and extends eastward 0.88 mile upstream. The wells at Upper WAG 2 were drilled and developed between December 1989 and October 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at Upper WAG-2. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

126 (ORNL/ER-70) Groundwater quality monitoring well installation for Waste Area Grouping 3 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mortimore, J.A.; Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 351p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003263. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of 15 groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 3. WAG 3 is located in Melton Valley, approximately 3,000 ft west of the west gate of Oak Ridge National Laboratory, and consists of an estimated 22 acres. The subject site contains three solid waste management units: the Contractors' Landfill, the Closed Scrap Metal Area, and Solid Waste Storage Area 3. The wells at WAG 3 were drilled and developed between

September 1987 and August 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The wells at WAG 3 were drilled with auger or air rotary rigs. Depending upon the hydrogeologic conditions present at each proposed well location, one of four basic installation methods was utilized. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 3. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

127 (ORNL/ER-71) Groundwater quality monitoring well installation for Waste Area Grouping 4 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mortimore, J.A. (Oak Ridge National Lab., TN (United States). Environmental Restoration Program); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 327p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003048. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of 15 groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 4. WAG 4 is comprised of about 27 acres located in Melton Valley approximately 2700 ft southwest of the Oak Ridge National Laboratory main plant. It contains three inactive solid waste management units: (1) the abandoned intermediate level liquid waste transfer line located along the WAG's northwestern boundary, (2) the experimental pilot pit area, and (3) SWSA 4, the largest unit in the WAG. The wells at WAG 4 were drilled and developed between September 1987 and October 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy (DOE), state, and Environmental Protection Agency regulatory requirements. The wells at WAG 4 were drilled with auger or air rotary rigs. Depending on the hydrogeologic conditions present at each proposed well location, one of four basic installation methods was utilized. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 4. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

128 (ORNL/ER-72) Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 273p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002307. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of nine groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 8 and two GQM wells on the perimeter of WAG 9. WAG 8 encompasses approximately 34 acres, most of which are located in Melton Valley. Irregular in shape, the site has two sinuous extensions from its northern end that contain the low-level radioactive waste (LLW) transfer lines. WAG 8 contains 22 solid waste management units (SWMUs) that can be divided into 4 groups. These groups include the High Flux Isotope Reactor/Transuranium Processing Facility waste collection basins, the LLW line leak sites, and the active LLW tanks. WAG 9 encompasses about 3 acres and is located west of the main portion of WAG 8 and south of Melton Valley Drive. WAG 9 contains four SWMUs. The wells in WAGs 8 and 9 were drilled and developed from June 1989 to March 1990. Monitoring wells were installed to characterize and assess the WAGs in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAGs 8 and 9. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

129 (ORNL/ER-73) Groundwater quality monitoring well installation for Waste Area Grouping at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program. Mortimore, J.A.; Lee, T.A. Oak Ridge National Lab., TN (United States). Sep 1994. 323p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002288. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of 18 groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 11. WAG 11 (White Wing Scrap Yard) is located on the west end of East Fork Ridge between White Wing Road and the Oak Ridge Turnpike. The scrap yard is approximately 25 acres in size. The wells at WAG 11 were drilled and developed between January 1990 and October 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The wells at WAG 11 were drilled with auger or air rotary rigs. Depending on the hydrogeologic conditions present at each proposed well location, one of four basic installation methods was utilized. Detailed procedures for well construction were specified by the Engineering Division to ensure that the wells would provide water samples representative of the aquifer. To ensure conformance with the specifications, Energy Systems Construction Engineering and ERCE provided continuous oversight of field activities. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 11. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists,

drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

130 (ORNL/ER-74) Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002292. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 17. WAG 17 is composed of approximately 23 acres and is located in Bethel Valley about 3,100 ft east of the Oak Ridge National Laboratory (ORNL) main plant area. The facilities in WAG 17 constitute the ORNL Services Area and include the shipping and receiving departments, machine shops, carpenter shops, paint shops, lead burning facilities, tritium facility, and the materials storage area. The wells at WAG 17 were drilled and developed between November 1989 and April 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 17. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG 17 characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

131 (ORNL/ER-152) Quality assurance/quality control summary report for Phase 1 of the Clinch River remedial investigation. Environmental Restoration Program. Holladay, S.K. (and others); Bevelhimer, M.S.; Brandt, C.C. Oak Ridge National Lab., TN (United States). Jul 1994. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001869. Source: OSTI; NTIS; INIS; GPO Dep.

The Clinch River Remedial Investigation (CRRI) is designed to address the transport, fate, and distribution of waterborne contaminants released from the US Department of Energy Oak Ridge Reservation and to assess potential risks to human health and the environment associated with these contaminants. Primary areas of investigation are Melton Hill Reservoir, the Clinch River from Melton Hill Dam to its confluence with the Tennessee River, Poplar Creek, and Watts Bar Reservoir. Phase 1 of the CRRI was a preliminary study in selected areas of the Clinch River/Watts Bar Reservoir. Fish, sediment, and water samples were collected and analyzed for inorganic, organic, and radiological parameters. Phase 1 was designed to (1) obtain high-quality data to confirm existing historical data for contaminant levels; (2) determine the range of contaminant concentrations present in the river-reservoir system; (3) identify specific contaminants of concern; and (4) establish the reference (background) concentrations for those contaminants. Quality assurance (QA) objectives for Phase I were that (1) scientific data generated would withstand scientific scrutiny; (2) data would be gathered using appropriate procedures for field sampling, chain-of-custody, laboratory analyses, and

data reporting; and (3) data would be of known precision and accuracy. These objectives were met through the development and implementation of (1) a QA oversight program of audits and surveillances; (2) standard operating procedures accompanied by a training program; (3) field sampling and analytical laboratory quality control requirements; (4) data and records management systems; and (5) validation of the data by an independent reviewer. Approximately 1700 inorganic samples, 1500 organic samples, and 2200 radiological samples were analyzed and validated. The QA completeness objective for the project was to obtain valid analytical results for at least 95% of the samples collected.

132 (ORNL/ER-169/S3) WAG 2 remedial investigation and site investigation site-specific work plan/health and safety checklist for the sediment transport modeling task. Holt, V.L.; Baron, L.A. Oak Ridge National Lab., TN (United States). May 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004733. Source: OSTI; NTIS; INIS; GPO Dep.

This site-specific Work Plan/Health and Safety Checklist (WP/HSC) is a supplement to the general health and safety plan (HASP) for Waste Area Grouping (WAG) 2 remedial investigation and site investigation (WAG 2 RI&SI) activities [Health and Safety Plan for the Remedial Investigation and Site Investigation of Waste Area Grouping 2 at the Oak Ridge National Laboratory, Oak Ridge, Tennessee (ORNL/ER-169)] and provides specific details and requirements for the WAG 2 RI&SI Sediment Transport Modeling Task. This WP/HSC identifies specific site operations, site hazards, and any recommendations by Oak Ridge National Laboratory (ORNL) health and safety organizations [i.e., Industrial Hygiene (IH), Health Physics (HP), and/or Industrial Safety] that would contribute to the safe completion of the WAG 2 RI&SI. Together, the general HASP for the WAG 2 RI&SI (ORNL/ER-169) and the completed site-specific WP/HSC meet the health and safety planning requirements specified by 29 CFR 1910.120 and the ORNL Hazardous Waste Operations and Emergency Response (HAZWOPER) Program Manual. In addition to the health and safety information provided in the general HASP for the WAG 2 RI&SI, details concerning the site-specific task are elaborated in this site-specific WP/HSC, and both documents, as well as all pertinent procedures referenced therein, will be reviewed by all field personnel prior to beginning operations.

133 (ORNL/ER-201) Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Aug 1994. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002305. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan addresses the monitoring, sampling, and analysis activities that will be conducted at seeps and springs and at two french drain outlets in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-land-burial disposal facility for low-level radioactive waste at Oak Ridge National Laboratory, a research facility owned by the US Department of Energy and operated by Martin Marietta Energy Systems, Inc. Initially, sampling will be conducted at as many as 15 locations within WAG 6 (as many as 13 seeps and 2 french

drain outlets). After evaluating the results obtained and reviewing the observations made by field personnel during the first round of sampling, several seeps and springs will be chosen as permanent monitoring points, together with the two french drain outlets. Baseline sampling of these points will then be conducted quarterly for 1 year (i.e., four rounds of sampling after the initial round). The samples will be analyzed for various geochemical, organic, inorganic, and radiological parameters. Permanent sampling points having suitable flow rates and conditions may be outfitted with automatic flow-monitoring equipment. The results of the sampling and flow-monitoring efforts will help to quantify flux moving across the ungauged perimeter of the site and will help to identify changes in releases from the contaminant sources.

134 (ORNL/ER-202) Surface water sampling and analysis plan for environmental monitoring in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program. Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Jun 1994. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94015939. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan addresses surface water monitoring, sampling, and analysis activities that will be conducted in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-burial land disposal facility for low-level radioactive waste at the Oak Ridge National Laboratory, a research facility owned by the US Department of Energy and managed by Martin Marietta Energy Systems, Inc. Surface water monitoring will be conducted at nine sites within WAG 6. Activities to be conducted will include the installation, inspection, and maintenance of automatic flow-monitoring and sampling equipment and manual collection of various water and sediment samples. The samples will be analyzed for various organic, inorganic, and radiological parameters. The information derived from the surface water monitoring, sampling, and analysis will aid in evaluating risk associated with contaminants migrating off-WAG, and will be used in calculations to establish relationships between contaminant concentration (C) and flow (Q). The C-Q relationship will be used in calculating the cumulative risk associated with the off-WAG migration of contaminants.

135 (ORNL/ER-213/R1) Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Marsh, J.D.; McCarthy, J.F. Oak Ridge National Lab., TN (United States). Environmental Sciences Div. Jul 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002294. Source: OSTI; NTIS; INIS; GPO Dep.

This Work Plan/Site Safety and Health Plan (SSHP) and the attached work plan are for the performance of the colloid sampling project at WAG 5. The work will be conducted by the Oak Ridge National Laboratory (ORNL) Environmental Sciences Division (ESD) and associated ORNL environmental, safety, and health support groups. This activity will fall under the scope of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). The purpose of this document is to establish health and safety guidelines to be followed by all personnel involved in conducting work for this project. Work will be conducted in accordance with requirements as stipulated in the ORNL

HAZWOPER Program manual, and applicable ORNL, Martin Marietta Energy Systems, Inc., and US Department of Energy (DOE) policies and procedures.

136 (ORNL/ER-237) Data analysis of a high-density polyethylene geomembrane located in Waste Area Grouping 6 at Oak Ridge National Laboratory. Martino, M.R. Oak Ridge National Lab., TN (United States). Environmental Restoration Div. Aug 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003260. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Program at Oak Ridge National Laboratory is monitoring the material properties of the High Density Polyethylene (HDPE) cap at Waste Area Grouping 6 for degradation due to exposure to the environment. The material properties of tear resistance, uniaxial yield and break stress, density and carbon black content were within an acceptable range of the minimum average values recommended. The latter three properties did not deteriorate over time when compared to the manufacturer's certificate of analysis. The results of the bent strip test showed failure of all specimens within 170 hours, compared to the recommended time of 1,500 hours without brittle failure recommended by NSF. The Notched Constant Tensile Load test reported transition times of 7 and 8 hours for a passive and active sample of the exposed HDPE liner. The percent crystallinity was found to be within the typical range of 40-60% for 80-mil HDPE; however, samples with high crystallinity, greater than 50%, tend to have poor stress crack performance. This was reinforced by the geomembrane's poor performance in the stress crack resistance tests. As a result of these data, the continued monitoring of the HDPE cap is recommended. Quality control measures must be enacted immediately if a definitive, scientific study is to be conducted that will be beneficial to manufacturers, installers, and users.

137 (ORNL/ER-261) Development of a passive-flow treatment system for ⁹⁰Sr-contaminated seep water at Waste Area Grouping 5 at Oak Ridge National Laboratory. Taylor, P.A. Oak Ridge National Lab., TN (United States). Aug 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003901. Source: OSTI; NTIS; INIS; GPO Dep.

Seep C is a free-flowing stream of groundwater (typical flow of 0.2 to 2 L/min) that emerges in a narrow valley below the old low-level waste disposal trenches in Solid Waste Storage Area 5 (SWSA 5), which is part of Waste Area Grouping 5 (WAG 5). The seep water contains high concentrations of Sr-90 (10,000 to 20,000 Bq/L) and contributes about 25% of all the Sr-90 leaving Oak Ridge National Laboratory. Seep C was identified as a primary source of off-site contaminant transport and was designated for an early removal action under the Comprehensive Environmental Response and Liability Act (CERCLA). A passive-flow treatment system was chosen as the most cost-effective method for treating the seep water. The goal of the removal action is to have a system operational by November 1, 1994, that reduces the Sr-90 concentration in the water collected and treated by at least 90%. In order to provide design and operating data for the full-scale system, a pilot-scale system, consisting of a 5-gal bucket with an inlet connection in the lid and a screened outlet on the bottom filled with 16 L of chabazite zeolite, was used to treat the seep water. The test was started on March 17, 1994, and concluded on June 15, 1994. The system treated 63,470 L (3967 bed volumes) of

water and 22.7 mCi of Sr-90 from the seep water. The system removed over 99.5% of the Sr-90 from the first 43,000 L of water treated, after which the removal efficiency slowly decreased as the zeolite became loaded until it reached 84% for the final sample. The passive system performed at least as well as comparable pumped zeolite systems in terms of removal efficiency and zeolite utilization. The test was terminated just before the construction crew mobilized at Seep C to build the full-scale system.

138 (ORNL/ER-264) Data summary for the near-shore sediment characterization task of the Clinch River Environmental Restoration Program. Levine, D.A.; Hargrove, W.W.; Campbell, K.R.; Wood, M.A.; Rash, C.D. Oak Ridge National Lab., TN (United States). Oct 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004730. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Near-Shore Sediment Characterization Task of the Clinch River Environmental Restoration Program (CR-ERP). The goals of the task were to (1) determine the extent to which near-shore surface sediments are contaminated by releases from the Oak Ridge Reservation (ORR) and (2) provide data for the Watts Bar Reservoir Interagency Permitting Group (WBRIPG) to evaluate the human health risks from exposure to sediments during and following dredging operations. The data collected for this task are also to be used in the Remedial Investigation/Feasibility Study (RLTS) for the CR-ERP operable units (Lower Watts Bar and Clinch River) to characterize the human health risk associated with exposure to near-shore sediments throughout the Watts Bar Reservoir.

139 (ORNL/ER-268) Data management implementation plan for the site characterization of the Waste Area Grouping 1 Groundwater Operable Unit at Oak Ridge National Laboratory. Ball, T.S.; Nickle, E.B. Oak Ridge National Lab., TN (United States). Oct 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003902. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Area Grouping (WAG) 1 Groundwater Operable Unit (OU) at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, is undergoing a site characterization. This project is not mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); therefore, no formalized meetings for data quality objective (DQO) development were held. Internally, DQOs were generated by the project team based on the end uses of the data to be collected. The 150-acre WAG 1 is contained within the ORNL security area. It includes all of the former ORNL radioisotope research, production, and maintenance facilities; former waste management areas; and some former administrative facilities. The goal of the WAG 1 Groundwater Site Characterization is to provide the necessary data on the nature and extent of groundwater contamination with an acceptable level of uncertainty to support the selection of remedial alternatives and to identify additional data needs for future actions. Primary objectives for the site characterization are: (1) To identify and characterize contaminant migration pathways based on the collection of groundwater data; (2) to identify sources of groundwater contamination and evaluate remedial actions which could be implemented to control or eliminate these sources; and (3) To conduct groundwater monitoring in support of other OUs in WAG 1 and the ORNL Groundwater OU.

140 (ORNL/ER-269) Hydrologic data summary for the White Oak Creek watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee (January-December 1993). Borders, D.M. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Civil Engineering); Frederick, B.J.; Reece, D.K.; McCalla, W.L.; Watts, J.A.; Ziegler, K.S. Oak Ridge National Lab., TN (United States). Environmental Sciences Div. Oct 1994. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003971. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4293.

This report summarizes, for the 12-month period (January through December 1993), the available dynamic hydrologic data collected, primarily, on the White Oak Creek (WOC) watershed along with information collected on the surface flow systems which affect the quality or quantity of surface water. Identification of spatial and temporal trends in hydrologic parameters and mechanisms that affect the movement of contaminants supports the development of interim corrective measures and remedial restoration alternatives. In addition, hydrologic monitoring supports long-term assessment of the effectiveness of remedial actions in limiting the transport of contaminants across Waste Area Grouping (WAG) boundaries and ultimately to the off-site environment. For these reasons, it is of paramount importance to the Environmental Restoration Program (ERP) to collect and report hydrologic data, an activity that contributes to the Site Investigations (SI) component of the ERP. This report provides and describes sources of hydrologic data for Environmental Restoration activities that use monitoring data to quantify and assess the impact from releases of contaminants from ORNL WAGs.

141 (ORNL/ER-281) Sampling and analysis plan for the site characterization of the waste area Grouping 1 groundwater operable unit at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Nov 1994. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005735. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Area Grouping (WAG) 1 at Oak Ridge National Laboratory (ORNL) includes all of the former ORNL radioisotope research, production, and maintenance facilities; former waste management areas; and some former administrative buildings. Site operations have contaminated groundwater, principally with radiological contamination. An extensive network of underground pipelines and utilities have contributed to the dispersal of contaminants to a known extent. In addition, karst geology, numerous spills, and pipeline leaks, together with the long and varied history of activities at specific facilities at ORNL, complicate contaminant migration-pathway analysis and source identification. To evaluate the extent of contamination, site characterization activity will include semiannual and annual groundwater sampling, as well as monthly water level measurements (both manual and continuous) at WAG 1. This sampling and analysis plan provides the methods and procedures to conduct site characterization for the Phase 1 Remedial Investigation of the WAG 1 Groundwater Operable Unit.

142 (ORNL/ER-283) Removal action work plan for Corehole 8 in Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); Foster-Wheeler Environmental Corp., Oak Ridge, TN (United States). Nov 1994.

20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003968. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the Waste Area Grouping 1 Corehole 8 Removal Action is to collect strontium-90 contaminated groundwater that is currently being discharged from existing storm drains into First Creek. ^{90}Sr has been identified as a major contributor to potential risk offsite. First Creek contributes about 10% of the ^{90}Sr contamination detected at White Oak Dam. This Removal Action Work Plan (RAWP) addresses construction of new french drains, gravity piping, and a pressure sewer pipeline to collect and pump the contaminated water to Manhole 24. The contaminated water will then flow through existing pipes to the Process Waste Treatment Plant for treatment. The proposed scope of work for this project includes the installation of approximately 480 ft of high-density polyethylene gravity piping, with cleanouts, to transport the contaminated water to a proposed pumping station. The contaminated water will then be pumped from the new pump station approximately 1,140 ft through a new force main to Manhole 24. This project will reduce the quantity of ^{90}Sr contaminated groundwater entering First Creek.

143 (ORNL/ER-290) Wet season reconnaissance report on Seeps and Springs in Waste Area Grouping 6 at Oak Ridge National Laboratory. Environmental Restoration Program. Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Feb 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010053. Source: OSTI; NTIS; GPO Dep.

As part of the Environmental Monitoring Plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee (DOE, 1993), seep and spring identification at WAG 6 is required. The Environmental Monitoring Plan requires the determination and monitoring of contaminant flux into and out of WAG 6. Part of the monitoring is accomplished through surface water monitoring stations and groundwater monitoring wells; however, these monitoring locations do not completely monitor all areas in WAG 6. Seeps and springs are known to exist within and around WAG 6. These seeps and springs can be used to provide; (1) additional monitoring data for near surface water/groundwater monitoring locations and (2) monitoring data for seep/spring locations where surface water/groundwater monitoring is not feasible. The identification and location of seeps and springs in and around the WAG 6 area were required to provide these data points. The location and identification of seeps and springs is referred to as a seep and spring reconnaissance. The reconnaissance for the WAG 6 area was conducted in accordance with Seep and Spring Reconnaissance Plan for Waste Area Grouping 6, (ECE, 1993). The plan required two reconnaissance efforts in order to compare and contrast seasonal effects on the seeps and springs. Both a dry season (August through October) and a wet season (November through mid-April) reconnaissance were performed. The plan required the identification of seep/spring locations under antecedent conditions of less than 0.1 inch of rainfall in the preceding 72 hours. The reconnaissance plan required that groundwater discharge (seeps and springs) locations be: visually identified, photographed, marked and numbered, and described. In addition, surface radiologic, volatile organic chemical measurements and estimated flow rate measurements were determined at each identified seep.

144 (ORNL/ER/Sub-87-99053/54) Additional borehole geophysical logging at Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Jul 1994. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019210. Source: OSTI; NTIS; INIS; GPO Dep.

This technical memorandum describes the borehole geophysical logging performed at selected coreholes at Waste Area Grouping 1 between March and November 1991 in support of the remedial investigation. The primary objectives of the borehole geophysical logging program were to (1) identify fractured bedrock zones and identify those fractured bedrock zones participating in active groundwater flow, (2) correlate the fractured intervals with the regional stratigraphy described, and (3) further characterize local bedrock geology and hydrogeology and gain insight about the bedrock aquifer flow system. A secondary objective was to provide stratigraphic correlations with existing logs for coreholes CH001 through CH005. Fractured bedrock zones and active or open fractures were identified in all coreholes logged. The fracture identification and analysis process was intended to distinguish between open or active fractures participating in active groundwater flow and closed or inactive fractures that are partially or completely filled (such as with calcite mineralization) and do not support groundwater circulation. Most of the fractures identified are bedding plane. Fracture occurrence varies with the different units of the Chickamauga Group; the greatest density of fractures and active fractures occurs in the upper 150 ft of stratum cored. Fractures actively contributing to groundwater flow were also identified, and direction of fluid movement within fractures was identified for those coreholes with flowmeter data.

145 (ORNL/GWPO-005) Environmental Sciences Division Groundwater Program Office: Annual report, 1993. Oak Ridge National Lab., TN (United States). 30 Sep 1993. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3656). Order Number DE94013983. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4285.

This first edition of the Martin Marietta Energy Systems, Inc., (Energy Systems) Groundwater Program Annual Report summarizes the work carried out by the Energy Systems GWPO for fiscal year (FY) 1993. This introductory section describes the GWPO's staffing, organization, and funding sources. The GWPO is responsible for coordination and oversight for all components of the groundwater program at the three Oak Ridge facilities [ORNL, the Oak Ridge Y-12 Plant, and the Oak Ridge K-25 Site], and the PGDP and PORTS, respectively. Several years ago, Energy systems senior management recognized that the manner in which groundwater activities were conducted at the five facilities could result in unnecessary duplication of effort, inadequate technical input to decisions related to groundwater issues, and could create a perception within the regulatory agencies of a confusing and inconsistent approach to groundwater issues at the different facilities. Extensive interactions among management from Environmental Compliance, Environmental Restoration (ER), Environmental Sciences Division, Environmental Safety and Health, and the five facilities ultimately led to development of a net technical umbrella organization for groundwater. On April 25, 1991, the GWPO was authorized to be set up within ORNL thereby establishing a central coordinating office that would develop a consistent technical and administrative direction

for the groundwater programs of all facilities and result in compliance with all relevant U.S. Environmental Protection Agency (EPA) regulations such as RCRA and Comprehensive Environmental Restoration, Compensation and Liability Act (CERCLA) as well as U.S. Department of Energy (DOE) regulations and orders. For example, DOE Order 5400.1, issued on November 9, 1988, called for each DOE facility to develop an environmental monitoring program for all media (e.g., air, surface water, and groundwater).

146 (ORNL/GWPO-011) MURF user's guide: A finite element model of multiple-pore-region flow through variably saturated subsurface media. Gwo, J.P. (Oak Ridge National Lab., TN (United States)); Jardine, P.M.; Yeh, G.T.; Wilson, G.V. Oak Ridge National Lab., TN (United States). Dec 1994. 110p. Sponsored by USDOE, Washington, DC (United States); Oak Ridge Inst. for Science and Education, TN (United States). DOE Contract AC05-84OR21400. (ORNL/M-4105). Order Number DE95009658. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4346.

Waste trenches at the Oak Ridge National Laboratory (ORNL) are usually located in the stormflow and vadose zones. Field observations indicate that these flow zones are responsible for about 90% of subsurface groundwater flow and may become the dominant waste transport path during rainfall events. The stormflow zone is composed of macroporous soils, and the vadose zone is composed of highly fractured saprolite developed from the bedrock. Mass transport processes in these flow zones are poorly understood because of the heterogeneous soils and highly structured geological units on the Oak Ridge Reservation (ORR). Understanding the processes is very critical to the prediction of waste movement and the remediation of disposal sites. In this report, we present a two-dimensional, finite element, multiregion subsurface flow code, MURF that simulates variably saturated fluid flow in vertical cross sections. A unique feature of MURF is the multiple, partially saturated pore regions that interact with each other under steady-state and transient conditions. The definition and background of multiregion concepts are presented in the next section. Governing flow equations of multiregion models are derived, and numerical implementation of the equations is presented. A three-pore-region example and the associated flow mechanisms are discussed. Two applications of MURF are also discussed with the preparation of input data detailed. In the appendixes, readers can find the input data guide of the code.

147 (ORNL/TM-12760) Effects of various uranium leaching procedures on soil: Short-term vegetation growth and physiology: Progress report, April 1994. Edwards, N.T. Oak Ridge National Lab., TN (United States). Aug 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94017316. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4289.

Significant volumes of soil containing elevated levels of uranium exist in the eastern United States. The contamination resulted from the development of the nuclear industry in the United States requiring a large variety of uranium products. The contaminated soil poses a collection and disposal problem of a magnitude that justifies the development of decontamination methods. Consequently, the Department of Energy (DOE) Office of Technology Development formed the Uranium Soils Integrated Demonstration (USID) program to address the problem. The fundamental goal of the USID

task group has been the selective extraction/leaching or removal of uranium from soil faster, cheaper, and safer than what can be done using current conventional technologies. The objective is to selectively remove uranium from soil without seriously degrading the soil's physicochemical characteristics and without generating waste that is difficult to manage and/or dispose of. However, procedures developed for removing uranium from contaminated soil have involved harsh chemical treatments that affect the physicochemical properties of the soil. The questions are (1) are the changes in soil properties severe enough to destroy the soil's capacity to support and sustain vegetation growth and survival? and (2) what amendments might be made to the leached soil to return it to a reasonable vegetation production capacity? This study examines the vegetation-support capacity of soil that had been chemically leached to remove uranium. The approach is to conduct short-term germination and phytotoxicity tests for evaluating soils after they are subjected to various leaching procedures followed by longer term pot studies on successfully leached soils that show the greatest capacity to support plant growth. This report details the results from germination and short-term phytotoxicity testing of soils that underwent a variety of leaching procedures at the bench scale at ORNL and at the pilot plant at Fernald.

148 (ORNL/TM-12772) In situ treatment of mixed contaminants in groundwater: Review of candidate processes. Korte, N.E. (ed.) (Oak Ridge National Lab., Grand Junction, CO (United States)); Siegrist, R.L. (ed.); Ally, M. Oak Ridge National Lab., TN (United States). Oct 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ESD-4290). Order Number DE95002442. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4290.

This document describes the screening and preliminary evaluation of candidate treatment for use in treating mixed contaminants volatile organic compounds (VOCs) and radionuclides in groundwater. Treating mixed contaminants presents unusual difficulties. Typically, VOCs are the most abundant contaminants, but the presence of radionuclides results in additional health concerns that must be addressed, usually by a treatment approach different from that used for VOCs. Furthermore, the presence of radionuclides may yield mixed solid wastes if the VOCs are treated by conventional means. These issues were specifically addressed in the evaluation of candidate treatment processes for testing in this program. Moreover, because no research or early development of a particular process would be performed, the technology review also focused on technologies that could be readily adapted and integrated for use with mixed contaminants. The objective is to couple emerging or available processes into treatment modules for use in situ. The three year project, to be completed in September 1996, includes a full-scale field demonstration. The findings reported in this document encompass all activities through the treatment process evaluations.

149 (ORNL/TM-12825) Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique. Gwo, J.P. (Oak Ridge National Lab., TN (United States)); Toran, L.E.; Morris, M.D.; Wilson, G.V. Oak Ridge National Lab., TN (United States). Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002841. Source: OSTI; NTIS; INIS; GPO Dep.

benefits resulted from the UFA method in FY 1993: hydrostratigraphic mapping, subsurface flux and recharge mapping, and pore water extraction from vadose zone samples for chemical analysis. 54 refs.

158 (PNL-9791) Estimation of the release and migration of nickel through soils and groundwater at the Hanford Site 218-E-12B Burial Ground. Rhoads, K. (and others); Bjornstad, B.N.; Lewis, R.E. Pacific Northwest Lab., Richland, WA (United States). May 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94013959. Source: OSTI; NTIS; INIS; GPO Dep.

An assessment was performed to evaluate release and transport of nickel from large metal components containing nickel-bearing alloys at the Hanford Site 218-E-12B Burial Ground. The potential for nickel within the components to enter groundwater under the burial site was investigated by examining available data on the site's geology, geochemistry, and geohydrology to develop a conceptual model for release and transport of nickel from the components. In addition, laboratory studies were performed to provide information needed for the model, but which was not available from existing databases. Estimates of future concentrations of nickel radioisotopes (^{59}Ni and ^{63}Ni) and total elemental nickel in the unconfined aquifer and in the Columbia River were developed based on this information.

159 (PNL-9986) Results from the preliminary conveyor evaluation of the high-energy beta scintillation sensor at the Fernald Soil Decontamination Pilot Plant. Schilk, A.J.; Knopf, M.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94016417. Source: OSTI; NTIS; INIS; GPO Dep.

We tested a high-energy beta scintillation sensor to evaluate its efficacy in continually characterizing washed soils moving on a conveyor belt at Fernald's Soil Decontamination Pilot Plant (SDPP). This sensor was originally developed for monitoring uranium-contaminated soils in the field. It has a multi-layer design that enables it to discriminate against lower-energy beta particles from natural sources. It can also distinguish, to some extent, gamma rays and cosmic-induced species. The sensor detects uranium activity indirectly, based on the assumption that secular equilibrium exists between the targeted radionuclide ($^{234\text{m}}\text{Pa}$) and its parent (^{238}U). Several 1-h background counts were made at the SDPP each day of the evaluation period. The average background count rate was found to be comparable to that observed under previous laboratory conditions. Static runs were performed on soils from SDPP test runs No. 1 and No. 17 to determine the extent of any residual activity following the decontamination process. Soils were found to contain 158 ± 30 pCi/g and 114 ± 25 pCi/g of ^{234}Th - $^{234\text{m}}\text{Pa}$ (^{238}U), respectively. But the soils had considerable moisture, and concern existed that this moisture would act as an additional beta attenuator and thereby give results that were erroneously low. Therefore, a soil sample was baked overnight, and the hard-baked clay that resulted was ground into small fragments and counted. This sample was counted for 30 min as before, and the total activity was determined to be 313 ± 44 pCi/g of ^{234}Th - $^{234\text{m}}\text{Pa}$ (^{238}U). Based on the test No. 1 results, a dry-to-wet activity ratio of 1.98 has been established. Hence, if the moisture content of test No. 17 was equivalent to that of test No. 1, the actual

^{234}Th - $^{234\text{m}}\text{Pa}$ (^{238}U) activity level is expected to be approximately 226 pCi/g.

160 (PNL-10060) Identification of radionuclides of concern in Hanford Site environmental cleanup. Perkins, R.W.; Jenquin, U.P. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004387. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to consider which radionuclides should be included in conducting environmental surveys relative to site remediation at Hanford. During the operation of the Hanford site, the fission product radionuclides and a large number of activation products including the transuranic radionuclides were formed. The reactor operations and subsequent chemical processing and metallurgical operations resulted in the environmental release of gaseous and liquid effluents containing some radionuclides; however, the majority of the radionuclides were stored in waste tanks or disposed to trenches and cribs. Since some contamination of both soils and subsurface waters occurred, one must decide which radionuclides still remain in sufficient amounts to be of concern at the time when site remediation is to be complete. Many of the radionuclides which have constituted the principal hazard during site operation have half-lives on the order of a year or less; therefore, they will have decayed to insignificant amounts by the year 2030, a possible date for completion of the remediation process.

161 (PNL-10079) Waste Tank Vapor Project: Vapor characterization of Tank 241-C-103: Report for SUMMA™ canister samples received 11/29/93 (sample jobs 4 and 5). Clauss, T.R.; Lucke, R.B.; McVeety, B.; Allwine, K.J.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000976. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of Sample Jobs 4 and 5 was to determine whether the organic nitrites observed on the outside of tank 241-C-103 originated in the tank or from degradation products of the high-efficiency particulate air (HEPA) filter. The plan was to take samples from either side of the HE-PA filter. The relative level of organic nitrites would help determine whether they were produced in the filter or the tank. Pacific Northwest Laboratory was responsible for analyzing the SUMMA™ canisters collected in support of this study. The laboratory was to analyze the SUMMA™ Canister samples according to letters of instruction and report all semivolatile and volatile organic constituents detected in the tank headspace. Pacific Northwest Laboratory was also to submit a letter report to the Program Manager of all qualitative and quantitative analytical data, and estimate concentrations of any aliphatic nitrites identified. This was one of the first sampling activities for this program, and a number of errors were made both in the field and in the laboratory. Because of these errors, the samples and results were of questionable value. Therefore, Westinghouse program management asked that the analysis of the samples for this report not be completed. This report describes the few results that were generated before we were asked to stop work on this activity. In addition to analyzing SUMMA™ canisters, PNL operates a site portable weather station near tank 241-C-103. Pacific Northwest Laboratory was required to collect atmospheric data starting 11/15/93, but the weather station was already collecting data during the time of both these two

sample jobs (11/12/93 and 11/16/93). Therefore, a summary of the atmospheric data is also presented in this report.

162 (PNL-10081) Waste tank vapor project: Vapor characterization of Tank 241-C-103: Data report for OVS samples collected from Sample Job 7b, Parts I and II, received 5/18/94 and 5/24/94. Clauss, T.R.; Edwards, J.A.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004275. Source: OSTI; NTIS; INIS; GPO Dep.

On 5/18/94, Westinghouse Hanford Company (WHC) delivered samples to Pacific Northwest Laboratory (PNL) that were collected from waste Tank 241-C-103 on 5/16/94. These samples were from Sample Job (SJ) 7b, Part 1. On 5/24/94, WHC delivered samples to PNL that were collected from waste Tank 241-C-103 on 5/18/94. These samples were from SJ7b, Part 2. A summary of data derived from the sampling of waste Tank 241-C-103 for gravimetric (H_2O) and normal paraffin hydrocarbon (NPH) concentrations are shown for SJ7b. Gravimetric analysis was performed on the samples within 24 hours of receipt by PNL. The NPH concentration of 10 samples collected for Part 1 was slightly higher than the average concentration for 15 samples collected in Part 2, $812 (\pm 133) \text{ mg/m}^3$ and $659 (\pm 88) \text{ mg/m}^3$, respectively. The higher concentrations measured in Part 1 samples may be because the samples in Part 1 were collected at a single level, 0.79 meters above the air-liquid interface. Part 2 samples were collected at three different tank levels, 0.79, 2.92, and 5.05 m above the air-liquid interface. In Part 2, the average NPH concentrations for 5 samples collected at each of three levels was similar: 697 (60 mg/m^3) at the low level, 631 (51 mg/m^3) at the mid level, and 651 (134 mg/m^3) at the high level. It is important to note that the measured tridecane to dodecane concentration remained constant in all samples collected in Parts 1 and 2. That ratio is 1.2 ± 0.05 . This consistent ratio indicates that there were no random analytical biases towards either compound.

163 (PNL-10082) Hanford Site ground-water monitoring for 1993. Dresel, P.E. (and others); Luttrell, S.P.; Evans, J.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 278p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002318. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Ground-Water Surveillance Project monitoring for calendar year 1993 on the Hanford Site, Washington. Hanford Site operations from 1943 onward produced large quantities of radiological and chemical waste that have impacted ground-water quality on the Site. Monitoring of water levels and ground-water chemistry is performed to track the extent of contamination and trends in contaminant concentrations. The 1993 monitoring was also designed to identify emerging ground-water quality problems. The information obtained is used to verify compliance with applicable environmental regulations and to evaluate remedial actions. Data from other monitoring and characterization programs were incorporated to provide an integrated assessment of Site ground-water quality. Additional characterization of the Site's geologic setting and hydrology was performed to support the interpretation of contaminant distributions. Numerical modeling of sitewide ground-water flow also supported the overall project goals. Water-level monitoring was performed to evaluate ground-water flow directions, to track changes in water levels, and

to relate such changes to changes in site disposal practices. Water levels over most of the Hanford Site continued to decline between June 1992 and June 1993. The greatest declines occurred in the 200-West Area. These declines are part of the continued response to the cessation of discharge to U Pond and other disposal facilities. The low permeability in this area which enhanced mounding of waste-water discharge has also slowed the response to the reduction of disposal. Water levels remained nearly constant in the vicinity of B Pond, as a result of continued disposal to the pond. Water levels measured from wells in the unconfined aquifer north and east of the Columbia River indicate that the primary source of recharge is irrigation practices.

164 (PNL-10094) Hydrogeology along the southern boundary of the Hanford Site between the Yakima and Columbia Rivers, Washington. Liikala, T.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 312p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000978. Source: OSTI; NTIS; INIS; GPO Dep.

US Department of Energy (DOE) operations at the Hanford Site, located in southeastern Washington, have generated large volumes of hazardous and radioactive wastes since 1944. Some of the hazardous wastes were discharged to the ground in the 1100 and 3000 Areas, near the city of Richland. The specific waste types and quantities are unknown; however, they probably include battery acid, antifreeze, hydraulic fluids, waste oils, solvents, degreasers, paints, and paint thinners. Between the Yakima and Columbia rivers in support of future hazardous waste site investigations and ground-water and land-use management. The specific objectives were to collect and review existing hydrogeologic data for the study area and establish a water-level monitoring network; describe the regional and study area hydrogeology; develop a hydrogeologic conceptual model of the unconfined ground-water flow system beneath the study area, based on available data; describe the flow characteristics of the unconfined aquifer based on the spatial and temporal distribution of hydraulic head within the aquifer; use the results of this study to delineate additional data needs in support of future Remedial Investigation/Feasibility Studies (RI/FS), Fate and Transport modeling, Baseline Risk Assessments (BRA), and ground-water and land-use management.

165 (PNL-10109) Leaching tendencies of uranium and regulated trace metals from the Hanford Site 300 Area North Process Pond sediments. Serne, R.J.; LeGore, V.L.; Mattigod, S.V. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000975. Source: OSTI; NTIS; INIS; GPO Dep.

Data are presented that address the leaching tendencies and the total chemical composition of metals in feed materials and soil-washed fines generated by Alternative Remediation Technology, Inc. during a pilot-scale soil physical separation test performed at the 300 Area North Process Pond (Facility 316-2) on the Hanford Site in the spring of 1994. Four 300 Area North Process Pond sediments and one sediment from outside the pond's fenced area were leach-tested using the Toxicity Characteristic Leach Procedure (TCLP) and other modified US Environmental Protection Agency and American Society for Testing and Materials protocols. Finally, leachate from the most contaminated sediment was used to load the Hanford sediment

obtained outside the facility to evaluate the potential for contaminant adsorption onto natural sediments. The sediment characterization, leach, and adsorption results will be used in the evaluation of remedial alternatives in the 300-FF-1 Operable Unit Remedial Investigation/Feasibility Study.

166 (PNL-10112) Gas distribution effects on waste properties: Viscosities of bubbly slurries. Gauglitz, P.A.; Shah, R.R.; Davis, R.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000771. Source: OSTI; NTIS; INIS; GPO Dep.

The retention and episodic release of flammable gases are critical safety concerns for double-shell tanks that contain waste slurries. The rheological behavior of the waste, particularly of the settled sludge, is critical to characterizing the tendency of the waste to retain gas bubbles. The presence of gas bubbles is expected to affect the rheology of the sludge, but essentially no literature data are available to assess the effect of bubbles. Accordingly, the objectives of this study are to develop models for the effect of gas bubbles on the viscosity of a particulate slurry, develop an experimental method (capillary rheometer), collect data on the viscosity of a bubbly slurry, and develop a theoretical basis for interpreting the experimental data from the capillary rheometer.

167 (PNL-10120) Mechanisms of gas bubble retention. Gauglitz, P.A.; Mahoney, L.A.; Mendoza, D.P.; Miller, M.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000773. Source: OSTI; NTIS; INIS; GPO Dep.

Retention and episodic release of flammable gases are critical safety concerns regarding double-shell tanks (DSTs) containing waste slurries. Previous investigations have concluded that gas bubbles are retained by the slurry that has settled at the bottom of the DST. However, the mechanisms responsible for the retention of these bubbles are not well understood. In addition, the presence of retained gas bubbles is expected to affect the physical properties of the sludge, but essentially no literature data are available to assess the effect of these bubbles. The rheological behavior of the waste, particularly of the settled sludge, is critical to characterizing the tendency of the waste to retain gas bubbles. The objectives of this study are to elucidate the mechanisms contributing to gas bubble retention and release from sludge such as is in Tank 241-SY-101, understand how the bubbles affect the physical properties of the sludge, develop correlations of these physical properties to include in computer models, and collect experimental data on the physical properties of simulated sludges with bubbles. This report presents a theory and experimental observations of bubble retention in simulated sludge and gives correlations and new data on the effect of gas bubbles on sludge yield strength.

168 (PNL-10123) Manipulation of natural subsurface processes: Field research and validation: Interim report. Fruchter, J.S. (and others); Spane, F.A.; Amonette, J.E. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003174. Source: OSTI; NTIS; INIS; GPO Dep.

Often the only alternative for treating deep subsurface contamination is in situ manipulation of natural processes to change the mobility or form of contaminants. However, the

complex interactions of natural subsurface physical, chemical, and microbial processes limit the predictability of the system-wide impact of manipulation based on current knowledge. This report is a summary of research conducted to examine the feasibility of controlling the oxidation-reduction (redox) potential of the unconfined aquifer at the Hanford Site in southeastern Washington State by introducing chemical reagents and microbial nutrients. The experiment would allow the testing of concepts and hypotheses developed from fundamental research in the US Department of Energy's (DOE's) Subsurface Science Program. Furthermore, the achievement of such control is expected to have implications for in situ remediation of dispersed aqueous contaminants in the subsurface environment at DOE sites nationwide, and particularly at the Hanford Site. This interim report summarizes initial research that was conducted between July 1990 and October 1991.

169 (PNL-10158) Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system. Spane, F.A. Jr.; Vermeul, V.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001922. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory, as part of the Hanford Site Ground-Water Surveillance Project, examines the potential for offsite migration of contamination within the upper basalt confined aquifer system. For the past 40 years, hydrologic testing of the upper basalt confined aquifer has been conducted by a number of Hanford Site programs. Hydraulic property estimates are important for evaluating aquifer flow characteristics (i.e., ground-water flow patterns, flow velocity, transport travel time). Presented are the first comprehensive Hanford Site-wide summary of hydraulic properties for the upper basalt confined aquifer system (i.e., the upper Saddle Mountains Basalt). Available hydrologic test data were reevaluated using recently developed diagnostic test analysis methods. A comparison of calculated transmissivity estimates indicates that, for most test results, a general correspondence within a factor of two between reanalysis and previously reported test values was obtained. For a majority of the tests, previously reported values are greater than reanalysis estimates. This overestimation is attributed to a number of factors, including, in many cases, a misapplication of nonleaky confined aquifer analysis methods in previous analysis reports to tests that exhibit leaky confined aquifer response behavior. Results of the test analyses indicate a similar range for transmissivity values for the various hydro-geologic units making up the upper basalt confined aquifer. Approximately 90% of the calculated transmissivity values for upper basalt confined aquifer hydrogeologic units occur within the range of 10^0 to 10^2 m²/d, with 65% of the calculated estimate values occurring between 10^1 to 10^2 m²/d. These summary findings are consistent with the general range of values previously reported for basalt interflow contact zones and sedimentary interbeds within the Saddle Mountains Basalt.

170 (PNL-10166) Field lysimeter studies for performance evaluation of grouted Hanford defense wastes. Last, G.V.; Serne, R.J.; LeGore, V.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 243p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007633. Source: OSTI; NTIS; INIS; GPO Dep.

The Grout Waste Test Facility (GWTF) consisted of four large field lysimeters designed to test the leaching and migration rates of grout-solidified low-level radioactive wastes generated by Hanford Site operations. Each lysimeter was an 8-m-deep by 2-m-dia closed-bottom caisson that was placed in the ground such that the uppermost rim remained just above grade. Two of these lysimeters were used; the other two remained empty. The two lysimeters that were used (A-1 and B-1) were backfilled with a two-layer soil profile representative of the proposed grout disposal site. The proposed grout disposal site (termed the Grout Treatment Facility Landfill) is located immediately east of the Hanford Site's 200 East Area. This soil profile consisted of a coarse sand into which the grout waste forms were placed and covered by 4 m of a very fine sand. The A-1 lysimeter was backfilled in March 1985, with a grout-solidified phosphate/sulfate liquid waste from N Reactor decontamination and ion exchange resin regeneration. The B-1 lysimeter was backfilled in September 1985 and received a grout-solidified simulated cladding removal waste representative of waste generated from fuel reprocessing operations at the head end of the Plutonium Uranium Extraction (PUREX) plant. Routine monitoring and leachate collection activities were conducted for over three years, terminating in January 1989. Drainage was collected sporadically between January 1989 and December 1992. Decontamination and decommissioning of these lysimeters during the summer of 1994, confirmed the presence of a 15 to 20-cm-long hairline crack in one of the bottom plate welds. This report discusses the design and construction of the GWTF, presents the routine data collected from this facility through January 1989 and subsequent data collected sporadically between 1989 and 1993, and provides a brief discussion concerning preliminary interpretation of the results.

171 (PNL-10170) Acquisition and reduction of data obtained from Tank 101-SY in-situ ball rheometer. Shepard, C.L. (and others); Chieda, M.A.; Kiriha, L.J. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004986. Source: OSTI; NTIS; INIS; GPO Dep.

Development of the ball rheometer to measure rheological properties and density of the waste in Hanford Tank 241-SY-101 will be completed around September 1994. Since the ball rheometer project began, a mixer pump has been installed in this tank, and by all accounts this pump has been very successful at mitigating the flammable gas problem associated with Tank 101-SY. Present plans now call for the use of mixer pumps in several other tanks. The ball rheometer will serve as a diagnostic tool for judging the effectiveness of mixing in Tank 101-SY and others and will be one of few in-situ probes available for diagnostic measurements. The in-situ data collection strategy and the methods of data analysis and reduction are presented in this final report concerning this instrument. It is believed that a generalized Bingham fluid model (Herschel-Bulkley fluid model) may be useful for describing at least some of the waste contained in Tank 101-SY, and data obtained in the tank will initially be reduced using this fluid model. The single largest uncertainty in the determination of the drag force on the ball is the drag force which will be experienced by the cable attached to the ball. This drag can be a substantial fraction of the total drag when the ball is deep within the tank. Careful accounting of the cable drag will be important in the reduction of the data. The data collection strategy allows the

determination of the waste fluid rheology both in the undisturbed state and after it has been disturbed by the ball. Fluid density will be measured at regular intervals.

172 (PNL-10170-Reissue) Acquisition and reduction of data obtained from tank 101-SY in-situ ball rheometer. Shepard, C.L. (Pacific Northwest Lab., Richland, WA (United States)); Chieda, M.A.; Kiriha, L.J.; Phillips, J.R.; Shekariz, A.; Terrones, G.; Abbott, J.; Unal, C.; Pasamehmetoglu, K.O.; Graham, A. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007634. Source: OSTI; NTIS; INIS; GPO Dep.

Development of the ball rheometer to measure rheological properties and density of the waste in Hanford Tank 241-SY-101 will be completed around September 1994. This instrument is expected to provide the first-of-its-kind in-situ measurements of the fluid properties of the waste contained within this tank. A mixer pump has been installed in this tank, and this pump has been very successful at mitigating the flammable gas problem associated with Tank 101-SY. The ball rheometer will serve as a diagnostic tool for judging the effectiveness of mixing in Tank 101-SY and others and will be one of few in-situ probes available for diagnostic measurements. Based on experiments performed at Los Alamos National Laboratory and Pacific Northwest Laboratory, it is believed that a generalized Bingham fluid model (Herschel-Bulkley fluid model) may be useful for describing at least some of the waste contained in Tank 101-SY, and data obtained in the tank will initially be reduced using this fluid model. The single largest uncertainty in the determination of the drag force on the ball is the drag force which will be experienced by the cable attached to the ball. This drag can be a substantial fraction of the total drag when the ball is deep within the tank. It is expected that the fluid properties may be history dependent, thus rheological properties of the undisturbed fluid may be different from the same properties after the fluid has been disturbed by passage of the ball. The data collection strategy allows the determination of the waste fluid rheology both in the undisturbed state and after it has been disturbed by the ball. Unlike the rheological parameters, measurement of density requires no model for its interpretation; however, the effects of yield stress may need to be accounted for. This measurement can be made with fairly good accuracy and may provide the most useful data in determination of mixer pump effectiveness.

173 (PNL-10171) Report on data requirements and hardware selection for in-situ ball viscometer. Shepard, C.L. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004276. Source: OSTI; NTIS; INIS; GPO Dep.

The in-situ ball rheometer is designed to provide data concerning the rheological properties of the waste contained in tank 101-SY. It is imperative that the data collected and the results obtained are useful to the community presently concerned with the mitigation of the waste contained within this tank. To ensure that this objective is met, discussions were held with representatives of different groups in order to determine their data needs. This report is a synopsis of these discussions. Four separate groups were identified as potential users of the data. Persons contacted included Don Trent (Pacific Northwest Laboratory (PNL)), who is involved with Tempest modeling of the tank; Randy Marlow and John

Strehlow (Westinghouse Hanford Company (WHC)), involved with structural analysis of the tank; Kemal Pasamehmetoglu and Cetin Unal (Los Alamos National Laboratory (LANL)), who are concerned with the safety analysis of activities performed within the tank; and Judith Bamberger, Paul Scott, and Gita Golcar (PNL) who are involved with the eventual retrieval of waste from the tank. Very specific questions were asked of these groups, including: From where in the tank are data needed? When should data be collected? In what manner are the data useful? What is the required accuracy of the data? Responses from each group are given.

174 (PNL-10182) Designing an enhanced groundwater sample collection system. Schalla, R. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001855. Source: OSTI; NTIS; INIS; GPO Dep.

As part of an ongoing technical support mission to achieve excellence and efficiency in environmental restoration activities at the Laboratory for Energy and Health-Related Research (LEHR), Pacific Northwest Laboratory (PNL) provided guidance on the design and construction of monitoring wells and identified the most suitable type of groundwater sampling pump and accessories for monitoring wells. The goal was to utilize a monitoring well design that would allow for hydrologic testing and reduce turbidity to minimize the impact of sampling. The sampling results of the newly designed monitoring wells were clearly superior to those of the previously installed monitoring wells. The new wells exhibited reduced turbidity, in addition to improved access for instrumentation and hydrologic testing. The variable frequency submersible pump was selected as the best choice for obtaining groundwater samples. The literature references are listed at the end of this report. Despite some initial difficulties, the actual performance of the variable frequency, submersible pump and its accessories was effective in reducing sampling time and labor costs, and its ease of use was preferred over the previously used bladder pumps. The surface seals system, called the Dedicator, proved to be useful accessory to prevent surface contamination while providing easy access for water-level measurements and for connecting the pump. Cost savings resulted from the use of the pre-production pumps (beta units) donated by the manufacturer for the demonstration. However, larger savings resulted from shortened field time due to the ease in using the submersible pumps and the surface seal access system. Proper deployment of the monitoring wells also resulted in cost savings and ensured representative samples.

175 (PNL-10184) Six-phase soil heating for enhanced removal of contaminants: Volatile organic compounds in non-arid soils integrated demonstration, Savannah River Site. Gauglitz, P.A. (and others); Bergsman, T.M.; Caley, S.M. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002856. Source: OSTI; NTIS; INIS; GPO Dep.

In November 1993, Pacific Northwest Laboratory (PNL) and Savannah River Site (SRS) personnel conducted a demonstration of six-phase soil heating (SPSH) at the Savannah River Site (SRS) in Aiken, South Carolina. The demonstration was part of the Volatile Organic Compounds in Non-Arid Soils Integrated Demonstration being conducted near the M-Area operations at the SRS, along a corridor

that once contained a process sewer leading to the M-Area seepage basin. In the early 1980s, this sewer line was discovered to be leaking process wastes into the subsurface and contributing to groundwater contamination in the vicinity of M-Area seepage basin. Although use of the sewer line has been discontinued, the slow release of chlorinated solvents such as trichloroethylene (TCE) and perchloroethylene (PCE) from the heterogeneous vadose zone soil continues to be a source of potential groundwater contamination. A significant portion of the VOCs at the demonstration site are retained in low-permeability clay zones. Previous studies have shown that the rate of conventional SVE remediation of the SRS clays is quite slow. The permeability of the clay is of order 10^{-12} cm², which makes this a particularly difficult interval to remediate. Thus, the challenge for SPSH is to effectively remediate this clay zone by accelerating the removal of TCE and PCE.

176 (PNL-10194) Hanford Permanent Isolation Barrier Program: Asphalt technology data and status report - FY 1994. Freeman, H.D.; Romine, R.A.; Zacher, A.H. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005752. Source: OSTI; NTIS; INIS; GPO Dep.

The asphalt layer within the Hanford Permanent Isolation Barrier (HPIB) is an important component of the overall design. This layer provides a RCRA equivalent backup to the overlying earthen layers in the unlikely event that these layers are not able to reduce the infiltration rate to less than 0.05 cm/yr. There is only limited amount of information on using asphalt for a moisture infiltration barrier over the long times required by the HPIB. Therefore, a number of activities are under way, as part of the Barrier Development Program, to obtain data on the performance of asphalt as a moisture barrier in a buried environment over a 1000-year period. These activities include (1) determining RCRA equivalency, (2) measurement of physical properties, (3) measurement of aging characteristics, and (4) relationship to ancient asphalt analogs. During FY 1994 progress was made on all of these activities. Studies were conducted both in the laboratory and on the prototype barrier constructed over the 216-B-57 crib in the 200 East Area on the Hanford Site. This report presents results obtained from the asphalt technology tasks during FY 1994. Also included are updates to planned activities for asphalt analogs and monitoring the asphalt test pad near the prototype barrier. Measurements of hydraulic conductivity on the HMAC portion of the prototype barrier show that the asphalt layers easily meet the RCRA standard of 1×10^{-7} cm/s. In-place measurements using a new field falling head technique show an average of 3.66×10^{-8} cm/s, while cores taken from the north end of the prototype and measured in a laboratory setup averaged 1.29×10^{-9} cm/s. Measurements made on the fluid applied asphalt membrane (polymer-modified asphalt) show an extremely low permeability of less than 1×10^{-11} cm/s.

177 (PNL-10196) Predicted impacts of future water level decline on monitoring wells using a ground-water model of the Hanford Site. Wurster, S.K.; Freshley, M.D. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004987. Source: OSTI; NTIS; INIS; GPO Dep.

A ground-water flow model was used to predict water level decline in selected wells in the operating areas (100, 200,

300, and 400 Areas) and the 600 Area. To predict future water levels, the unconfined aquifer system was stimulated with the two-dimensional version of a ground-water model of the Hanford Site, which is based on the Coupled Fluid, Energy, and Solute Transport (CFEST) Code in conjunction with the Geographic Information Systems (GIS) software package. The model was developed using the assumption that artificial recharge to the unconfined aquifer system from Site operations was much greater than any natural recharge from precipitation or from the basalt aquifers below. However, artificial recharge is presently decreasing and projected to decrease even more in the future. Wells currently used for monitoring at the Hanford Site are beginning to go dry or are difficult to sample, and as the water table declines over the next 5 to 10 years, a larger number of wells is expected to be impacted. The water levels predicted by the ground-water model were compared with monitoring well completion intervals to determine which wells will become dry in the future. Predictions of wells that will go dry within the next 5 years have less uncertainty than predictions for wells that will become dry within 5 to 10 years. Each prediction is an estimate based on assumed future Hanford Site operating conditions and model assumptions.

178 (PNL-10208) Waste tank vapor project: Vapor space characterization of waste tank 241-BY-104: Results from samples collected on June 24, 1994. Clauss, T.W.; Ligothe, M.W.; McVeety, B.D.; Pool, K.H.; Lucke, R.B.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003803. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes results of the analyses of tank-headspace samples taken from Hanford waste Tank 241-BY-104 (referred to as Tank BY-104) on June 24, 1994. The Pacific Northwest Laboratory (PNL) contracted with Westinghouse Hanford Company (WHC) to provide sampling devices and analyze inorganic and organic samples collected from the tank headspace. The sample job was designated S4019 and was performed by WHC on June 24, 1994 using the vapor sampling system (VSS). The results of the analyses are expected to be used in the determination of safety and toxicological issues related to the tank-headspace gas as described in the WHC report entitled Data Quality Objectives for Generic In-Tank Health and Safety Vapor Issue Resolution, WHC-SD-WM-DQO-002, Rev. 0. Sampling devices, including 16 sorbent trains (for inorganic analyses), and 5 SUMMA™ canisters (for organic analyses), were supplied to the WHC sampling staff on June 20, 1994. Samples were taken (by WHC) on June 24. The samples were returned from the field on June 27. The inorganic samples delivered to PNL on chain-of-custody (COC) 006893 included 16 sorbent trains as described in Tables 2.2, 2.3, and 2.4. Additional inorganic blank spikes were obtained from related sample jobs. SUMMA™ samples delivered to PNL on COC 006896 included one ambient air sample, one ambient-air sample through the sampling system, and three tank-headspace SUMMA™ canister samples. The samples were inspected upon delivery to the 326/23B laboratory and logged into PNL laboratory record book 55408. Custody of the sorbent trains was transferred to PNL personnel performing the inorganic analysis and stored at refrigerated ($\leq 10^{\circ}\text{C}$) temperature until the time of analysis. Access to the 326/23B laboratory is limited to PNL personnel working on the waste-tank safety program.

179 (PNL-10209) Waste Tank Vapor Project: Enhancements to the PNL SUMMA™ analytical laboratory tank organic vapor support task. McVeety, B.D.; Lucke, R.B.; Clauss, T.R.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004277. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the status, as of the end of FY 1994, on the individual components of the SUMMA™ Canister Analytical Laboratory that Pacific Northwest Laboratory has assembled to support the Hanford Tank Safety Issues Program.

180 (PNL-10240) Theory of operation for the ball rheometer. Shepard, C.L. (Pacific Northwest Lab., Richland, WA (United States)); Colson, J.B.; Pasamehmetoglu, K.O.; Unal, C.; Edwards, J.N.; Abbott, J. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004278. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site contains over 100 high-volume tanks containing high-level radioactive wastes. The tank which has received the most attention is Tank 101-SY, which is a double shell tank containing a caustic mixed-waste slurry. The ball rheometer developed in this work is intended at least initially for application in this tank. Tank 101-SY is known to periodically release flammable and toxic gases during events known as rollovers. The tank waste is largely made up of two layers, a supernatant liquid layer underneath which is a thick sludge layer. The two layers are called the convective (C) and the nonconvective (NC) regions, so called because of the thermal transport properties ascribed to each. Although they have significant uncertainty, the current theology data suggest the existence of a yield stress in the highly viscous nonconvective layer. Gas generated in the waste can be held in the NC layer if the material yield strength or its viscosity is high enough. Gas cannot be held in the C layer to any appreciable extent unless it is in solution. As gas continues to be generated by chemical or other processes, the number of gas bubbles and/or their sizes increases in the NC layer. A rollover occurs when the amount of gas trapped in the nonconvective region becomes great enough to overcome forces holding it in place. These forces are believed to be dependent on the theology of the nonconvective region and perhaps the bubble surface tension. The buoyancy forces on the bubbles exceed the restraining forces arising from the yield stress and the viscosity of the NC layer. Theology is then seen to be quite important in determining the nature of gas release events in this tank.

181 (PNL-10275) Hanford prototype surface barrier status report: FY 1994. Gee, G.W.; Freeman, H.D.; Walters, W.H. Jr.; Ligothe, M.W.; Campbell, M.D.; Ward, A.L.; Link, S.O.; Smith, S.K.; Gilmore, B.G.; Romine, R.A. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004714. Source: OSTI; NTIS; INIS; GPO Dep.

A full-scale prototype surface barrier has been constructed at the 200 BP-1 Operable Unit in the 200 East Area of the Hanford Site. The prototype barrier has been built to evaluate design, construction, and performance features of a surface barrier that may be used for in-place disposal of wastes at the Hanford Site. The design basis and construction of the prototype have been documented. A testing and

monitoring plan has been published outlining specific tests planned for the prototype. The current report describes initial testing activities conducted in FY 1994 and outlines activities for testing and monitoring at the prototype barrier in the future. Asphalt permeability was tested during construction of the prototype in April and May 1994. Cores taken from the asphalt concrete layer were tested in the laboratory and found to have hydraulic conductivities below $1\text{E-}09$ cm/s. Field measurements of hydraulic conductivity taken on the asphalt concrete using a specially-designed falling head permeameter were more than ten times higher than those from core tests. The higher values are attributed to transient flow through the permeameter seal. In spite of this difficulty, the more rapid field measurements (1-day tests in the field compared to 3 months in the laboratory) gave values as low as $1\text{E-}09$ cm/s and averaged about $1\text{E-}08$ cm/s. Samples of fluid-applied asphalt material, used as a sealant on the asphalt concrete layer, were tested in the laboratory and found to have hydraulic conductivities below $1\text{E-}10$ cm/s. Measurements of hydraulic conductivity taken on an adjacent asphalt test pad using a sealed double-ring infiltrometer (SDRI) were initiated in September 1994 and are expected to be completed in November 1994. Construction of the prototype surface barrier was completed in August 1994.

182 (PNL-10285) Estimated recharge rates at the Hanford Site. Fayer, M.J.; Walters, T.B. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008084. Source: OSTI; NTIS; INIS; GPO Dep.

The Ground-Water Surveillance Project monitors the distribution of contaminants in ground water at the Hanford Site for the U.S. Department of Energy. A subtask called "Water Budget at Hanford" was initiated in FY 1994. The objective of this subtask was to produce a defensible map of estimated recharge rates across the Hanford Site. Methods that have been used to estimate recharge rates at the Hanford Site include measurements (of drainage, water contents, and tracers) and computer modeling. For the simulations of 12 soil-vegetation combinations, the annual rates varied from 0.05 mm/yr for the Ephrata sandy loam with bunchgrass to 85.2 mm/yr for the same soil without vegetation. Water content data from the Grass Site in the 300 Area indicated that annual rates varied from 3.0 to 143.5 mm/yr during an 8-year period. The annual volume of estimated recharge was calculated to be 8.47×10^9 L for the potential future Hanford Site (i.e., the portion of the current Site bounded by Highway 240 and the Columbia River). This total volume is similar to earlier estimates of natural recharge and is 2 to 10x higher than estimates of runoff and ground-water flow from higher elevations. Not only is the volume of natural recharge significant in comparison to other ground-water inputs, the distribution of estimated recharge is highly skewed to the disturbed sandy soils (i.e., the 200 Areas, where most contaminants originate). The lack of good estimates of the means and variances of the supporting data (i.e., the soil map, the vegetation/land use map, the model parameters) translates into large uncertainties in the recharge estimates. When combined, the significant quantity of estimated recharge, its high sensitivity to disturbance, and the unquantified uncertainty of the data and model parameters suggest that the defensibility of the recharge estimates should be improved.

183 (PNL-10379) Geochemical factors affecting radionuclide transport through near and far fields at a

Low-Level Waste Disposal Site. Kaplan, D.I. (Pacific Northwest Lab., Richland, WA (United States)); Seme, R.J.; Piepkho, M.G. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008921. Source: OSTI; NTIS; INIS; GPO Dep.

The concentration of low-level waste (LLW) contaminants in groundwater is determined by the amount of contaminant present in the solid waste, rate of release from the waste and surrounding barriers, and a number of geochemical processes including adsorption, desorption, diffusion, precipitation, and dissolution. To accurately predict radionuclide transport through the subsurface, it is essential that the important geochemical processes affecting radionuclide transport be identified and, perhaps more importantly, accurately quantified and described in a mathematically defensible manner.

184 (PNL-10422) Geology, hydrology, chemistry, and microbiology of the in situ bioremediation demonstration site. Newcomer, D.R.; Doremus, L.A.; Hall, S.H.; Truex, M.J.; Vermeul, V.R.; Engelman, R.E. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008896. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes characterization information on the geology, hydrology, microbiology, contaminant distribution, and ground-water chemistry to support demonstration of in situ bioremediation at the Hanford Site. The purpose of this information is to provide baseline conditions, including a conceptual model of the aquifer being utilized for in situ bioremediation. Data were collected from sampling and other characterization activities associated with three wells drilled in the upper part of the suprabasalt aquifer. Results of point-dilution tracer tests, conducted in the upper 9 m (30 ft) of the aquifer, showed that most ground-water flow occurs in the upper part of this zone, which is consistent with hydraulic test results and geologic and geophysical data. Other tracer test results indicated that natural ground-water flow velocity is equal to or less than about 0.03 m/d (0.1 ft/d). Laboratory hydraulic conductivity measurements, which represent the local distribution of vertical hydraulic conductivity, varied up to three orders of magnitude. Based on concentration data from both the vadose and saturated zone, it is suggested that most, if not all, of the carbon tetrachloride detected is representative of the aqueous phase. Concentrations of carbon tetrachloride, associated with a contaminant plume in the 200-West Area, ranged from approximately 500 to 3,800 $\mu\text{g/L}$ in the aqueous phase and from approximately 10 to 290 $\mu\text{g/L}$ in the solid phase at the demonstration site. Carbon tetrachloride gas was detected in the vadose zone, suggesting volatilization and subsequent upward migration from the saturated zone.

185 (PNL-10423) Environmental surveillance master sampling schedule. Bisping, L.E. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007635. Source: OSTI; NTIS; INIS; GPO Dep.

Contains one map.

Environmental surveillance of the Hanford Site and surrounding areas is conducted by the Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy (DOE). This document contains the planned 1994 schedules for routine collection of samples for the Surface Environmental

Surveillance Project (SESP), Drinking Water Project, and Ground-Water Surveillance Project. Samples are routinely collected for the SESP and analyzed to determine the quality of air, surface water, soil, sediment, wildlife, vegetation, foodstuffs, and farm products at Hanford Site and surrounding communities. The responsibility for monitoring onsite drinking water falls outside the scope of the SESP. PNL conducts the drinking water monitoring project concurrent with the SESP to promote efficiency and consistency, utilize expertise developed over the years, and reduce costs associated with management, procedure development, data management, quality control, and reporting. The ground-water sampling schedule identifies ground-water sampling events used by PNL for environmental surveillance of the Hanford Site. Sampling is indicated as annual, semi-annual, quarterly, or monthly in the sampling schedule. Some samples are collected and analyzed as part of ground-water monitoring and characterization programs at Hanford (e.g. Resources Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Operational). The number of samples planned by other programs are identified in the sampling schedule by a number in the analysis column and a project designation in the Cosample column. Well sampling events may be merged to avoid redundancy in cases where sampling is planned by both-environmental surveillance and another program.

186 (PNL-10483) Direct measurement of strontium-90 and uranium-238 in soils on a real-time basis: 1994 summary report. Schilk, A.J.; Hubbard, C.W.; Knopf, M.A.; Thompson, R.C. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010548. Source: OSTI; NTIS; INIS; GPO Dep.

Traditional methodologies for quantitative characterization of radionuclide-contaminated soils over extended areas are often tedious, costly, and non-representative. A rapid characterization methodology was designed that provides reliable output with spatial resolution on the order of a few meters or less. It incorporates an innovative sensor of square plastic scintillating fibers that has been designed to be placed directly on or above a contaminated soil to detect and quantify high-energy beta particles associated with the decay chains of uranium and/or strontium. Under the direction and auspices of the DOE's Characterization, Monitoring, and Sensor Technology Integrated Program, Pacific Northwest Laboratory (PNL) constructed a high-energy beta scintillation sensor that was optimized for the detection and quantification of uranium and strontium contamination in surface soils (in the presence of potentially interfering natural and anthropogenic radionuclides), demonstrated and evaluated this detector in various field and laboratory scenarios, and provides this document in completion of the aforementioned requirements.

187 (PNL-10484) In situ mapping of radionuclides in subsurface and surface soils: 1994 Summary report. Schilk, A.J.; Hubbard, C.W.; Knopf, M.A.; Abel, K.H. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010407. Source: OSTI; NTIS; INIS; GPO Dep.

Uranium production and support facilities at several DOE sites occasionally caused local contamination of some surface and subsurface soils. The thorough cleanup of these

sites is a major public concern and a high priority for the US Department of Energy, but before any effective remedial protocols can be established, the three-dimensional distributions of target contaminants must be characterized. Traditional means of measuring radionuclide activities in soil are cumbersome, expensive, time-consuming, and often do not accurately reflect conditions over very large areas. New technologies must be developed, or existing ones improved, to allow cheaper, faster, and safer characterization of radionuclides in soils at these sites. The Pacific Northwest Laboratory (PNL) was tasked with adapting, developing, and demonstrating technologies to measure uranium in surface and subsurface soils. In partial completion of this effort, PNL developed an improved in situ gamma-ray spectrometry system to satisfy the technical requirements. This document summarizes fiscal-year 1994 efforts at PNL to fulfill requirements for TTP #321103 (project #19307). These requirements included (a) developing a user-friendly software package for reducing field-acquired gamma-ray spectra, (b) constructing an improved data-acquisition hardware system for use with high-purity germanium detectors, (c) ensuring readiness to conduct field mapping exercises as specified by the sponsor, (d) evaluating the in situ gamma-ray spectrometer for the determination of uranium depth distribution, and (e) documenting these efforts.

188 (PNL-10508) Estimation of natural ground water recharge for the performance assessment of a low-level waste disposal facility at the Hanford Site. Rockhold, M.L.; Fayer, M.J.; Kincaid, C.T.; Gee, G.W. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010323. Source: OSTI; NTIS; INIS; GPO Dep.

In 1994, the Pacific Northwest Laboratory (PNL) initiated the Recharge Task, under the PNL Vitrification Technology Development (PVTD) project, to assist Westinghouse Hanford Company (WHC) in designing and assessing the performance of a low-level waste (LLW) disposal facility for the US Department of Energy (DOE). The Recharge Task was established to address the issue of ground water recharge in and around the LLW facility and throughout the Hanford Site as it affects the unconfined aquifer under the facility. The objectives of this report are to summarize the current knowledge of natural ground water recharge at the Hanford Site and to outline the work that must be completed in order to provide defensible estimates of recharge for use in the performance assessment of this LLW disposal facility. Recharge studies at the Hanford Site indicate that recharge rates are highly variable, ranging from nearly zero to greater than 100 mm/yr depending on precipitation, vegetative cover, and soil types. Coarse-textured soils without plants yielded the greatest recharge. Finer-textured soils, with or without plants, yielded the least. Lysimeters provided accurate, short-term measurements of recharge as well as water-balance data for the soil-atmosphere interface and root zone. Tracers provided estimates of longer-term average recharge rates in undisturbed settings. Numerical models demonstrated the sensitivity of recharge rates to different processes and forecast recharge rates for different conditions. All of these tools (lysimetry, tracers, and numerical models) are considered vital to the development of defensible estimates of natural ground water recharge rates for the performance assessment of a LLW disposal facility at the Hanford Site.

189 (PNL-10535) Environmental monitoring of Columbia River sediments: Grain-size distribution and contaminant association. Blanton, M.L.; Gardiner, W.W.; Dirkes, R.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011670. Source: OSTI; NTIS; INIS; GPO Dep.

Based on the results of this study and literature review, the following conclusions can be made: Sediment grain size and TOC (total organic carbon) influence contaminant fate and transport (in general, sediments with higher TOC content and finer grain-size distribution can have higher contaminant burdens than sediments from a given river section that have less TOC and greater amounts of coarse-grained sediments). Physiochemical sediment characteristics are highly variable among monitoring sites along the Columbia River. Sediment grain characterization and TOC analysis should be included in interpretations of sediment-monitoring data.

190 (PNL-10544) Characterization and monitoring of 300 Area facility liquid waste streams: 1994 Annual report. Manke, K.L. (ed.); Riley, R.G.; Ballinger, M.Y.; Damberg, E.G.; Evans, J.C.; Julia, J.L.; Olsen, K.B.; Ozanich, R.M.; Thompson, C.J.; Vogel, H.R. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011502. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of characterizing and monitoring the following sources during calendar year 1994: liquid waste streams from Buildings 306, 320, 324, 326, 331, and 3720 in the 300 Area of Hanford Site and managed by the Pacific Northwest Laboratory; treated and untreated Columbia River water (influent); and water at the confluence of the waste streams (that is, end-of-pipe). Data were collected from March to December before the sampling system installation was completed. Data from this initial part of the program are considered tentative. Samples collected were analyzed for chemicals, radioactivity, and general parameters. In general, the concentrations of chemical and radiological constituents and parameters in building wastewaters which were sampled and analyzed during CY 1994 were similar to historical data. Exceptions were the occasional observances of high concentrations of chloride, nitrate, and sodium that are believed to be associated with excursions that were occurring when the samples were collected. Occasional observances of high concentrations of a few solvents also appeared to be associated with infrequent building releases. During calendar year 1994, nitrate, aluminum, copper, lead, zinc, bis(2-ethylhexyl) phthalate, and gross beta exceeded US Environmental Protection Agency maximum contaminant levels.

191 (PNL-SA-22803) Contaminants at DOE sites and their susceptibility to bioremediation. Lenhard, R.J.; Skeen, R.S.; Brouns, T.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9311115-3: Symposium on science of advanced batteries, Cleveland, OH (United States), 8-9 Nov 1993). Order Number DE94008734. Source: OSTI; NTIS; INIS; GPO Dep.

Contaminants at DOE sites encompass a range of common industrial pollutants. However, the prevalence of contaminant mixtures including organics, metals, and radionuclides is relatively unique to DOE's facilities. Bioremediation has been shown to be effective for destruction of

many of the organic pollutants. The technology also has promise for application to many of the metals and radionuclides; however, field demonstrations for these applications have not yet been attempted. Because of the complexity of biodegradation of even a single-compound class, little has been done to develop or demonstrate in situ bioremediation technologies for multicomponent combinations. The current bioremediation demonstration on CCl_4 and nitrates within the VOC-Arid Integrated Demonstration is one the first efforts to address inorganic and organic co-contaminants simultaneously. Additional research, technology development, and field demonstrations are needed to evaluate the applicability of in situ bioremediation to DOE's most common contaminant mixtures.

192 (PNL-SA-23722) Evaluation of bacterial detachment rates in porous media. Peyton, B.M. (Pacific Northwest Lab., Richland, WA (United States)); Hooker, B.S.; Skeen, R.S.; Cunningham, A.B.; Lundman, R.W. Pacific Northwest Lab., Richland, WA (United States). May 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940526-7: 16. symposium on biotechnology for fuels and chemicals, Gatlinburg, TN (United States), 9-13 May 1994). Order Number DE94014411. Source: OSTI; NTIS; GPO Dep.

The ability of published biomass detachment rate expressions to describe experimental data obtained from porous media reactors using *Pseudomonas aeruginosa* grown aerobically on glucose was evaluated. A first-order rate expression on attached biomass concentration best reflected effluent substrate concentration for combined data sets. Detachment rate coefficient k_{d1} was dependent on initial substrate concentration. Simulation of porous media reactor experiments indicated that responses using higher influent substrate concentrations possessed greater sensitivity to variations in k_{d1} . Simulations of field bioremediation systems suggest the use of accurate biofilm development kinetics is important in the prediction of well bore biofouling.

193 (PNL-SA-23775) Direct measurements of transport properties are essential for site characterization. Wright, J. (Pacific Northwest Lab., Richland, WA (United States)); Conca, J.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-105: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95004940. Source: OSTI; NTIS; INIS; GPO Dep.

Direct measurements of transport parameters on subsurface sediments using the UFA method provided detailed hydrostratigraphic mapping, and subsurface flux distributions at a mixed-waste disposal site at Hanford. Seven hundred unsaturated conductivity measurements on fifty samples were obtained in only six months total of UFA run time. These data are used to provide realistic information to conceptual models, predictive models and restoration strategies. The UFA instrument consists of an ultracentrifuge with a constant, ultralow flow pump that provides fluid to the sample surface through a rotating seal assembly and microdispersal system. Effluent from the sample is collected in a transparent, volumetrically-calibrated chamber at the bottom of the sample assembly. Using a strobe light, an observer can check the chamber while the sample is being centrifuged. Materials can be run in the UFA as recomposited samples or in situ samples can be subcored directly into the sample UFA chamber.

194 (PNL-SA-23806) Simulation of two- and three-dimensional dense solute plume behavior with the the METROPOL-3 code. Oostrom, M. (Pacific Northwest Lab., Richland, WA (United States)); Roberson, K.R.; Leijnse, A. Pacific Northwest Lab., Richland, WA (United States). Jul 1994, 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940742-8: Computational methods in water resources, Heidelberg (Germany), 19-22 Jul 1994). Order Number DE94017461. Source: OSTI; NTIS; INIS; GPO Dep.

Contaminant plumes emanating from waste disposal facilities are often denser than the ambient groundwater. These so-called dense plumes sink deeper into phreatic aquifers and may, under certain conditions, become unstable. The behavior of variable density, aqueous-phase contaminant plumes in saturated, homogeneous 2-D and 3-D intermediate-scale aquifer models was investigated with the finite element code METROPOL-3. The numerical results compare, in a quantitative sense, to previously reported laboratory-scale transport experiments. The simulations show that dense plumes are more likely to penetrate deeper into aquifers and eventually become unstable with increasing density differences between the leachate solution and the ambient groundwater, and other important parameters as the saturated hydraulic conductivity of the porous medium, leakage-rate of the contaminant solution, and source width. The significance of unstable behavior decreases with increasing dispersivity values. It was observed that 3-D flow patterns have a stable effect on dense contaminant plume behavior.

195 (PNL-SA-23882) Scintillating-fiber technology for the detection of strontium-90 and uranium-238. Schilk, A.J. Pacific Northwest Lab., Richland, WA (United States). Jun 1994, 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940602-18: 35. annual meeting of the American Nuclear Society, New Orleans, LA (United States), 11-16 Jun 1994). Order Number DE94017459. Source: OSTI; NTIS; INIS; GPO Dep.

An innovative, scintillating-fiber-based sensor has been designed to be placed directly on or above a contaminated soil surface and uses a multi-layer stack of fiber ribbons and custom electronic circuitry to observe and quantify high-energy beta particles that originate from the decay of strontium or uranium. A recent study identified 59 waste sites at 14 US Department of Energy facilities across the nation that exhibit radionuclide contamination in excess of established limits and in many cases the radionuclides of concern included ^{238}U and ^{90}Sr . The need to rapidly and efficiently characterize these sites and the potentially contaminated regions that surround them represents a technological challenge with no existing solution.

196 (PNL-SA-23918) A new ground-penetrating radar system for remote site characterization. Davis, K.C.; Sandness, G.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994, 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940859-28: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE95003153. Source: OSTI; NTIS; INIS; GPO Dep.

The cleanup of waste burial sites and military bombing ranges involves the risk of exposing field personnel to toxic chemicals, radioactive materials, or unexploded munitions.

Time-consuming and costly measures are required to provide protection from those hazards. Therefore, there is a growing interest in developing remotely controlled sensors and sensor platforms that can be employed in site characterization surveys. A specialized ground-penetrating radar has been developed to operate on a remotely controlled vehicle for the non-intrusive subsurface characterization of buried waste sites. Improved radar circuits provide enhanced performance, and an embedded microprocessor dynamically optimizes operation. The radar unit is packaged to survive chemical contamination and decontamination.

197 (PNL-SA-24002) Field test of six-phase soil heating at the Savannah River Site. Gauglitz, P.A. (and others); Roberts, J.S.; Bergsman, T.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994, 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-11: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007167. Source: OSTI; NTIS; INIS; GPO Dep.

Six-Phase Soil Heating (SPSH) was demonstrated as a viable technology for heating low permeability soils containing volatile organic contaminants as part of the Volatile Organic Compounds in Non-Arid Soils Integrated Demonstration (VOC Non-Arid ID) at the Savannah River Site. The soil at the integrated demonstration site is contaminated with perchloroethylene (PCE) and trichloroethylene (TCE); the highest soil contamination occurs in clay rich zones that are ineffectively treated by conventional soil vapor extraction due to the very low permeability of the clay. The SPSH demonstration sought to heat the clay zone and enhance the performance of conventional soil vapor extraction. Thermocouples at 30 locations quantified the areal and vertical heating within the treated zone. Results show successful heating of the targeted clay zone that contained the higher levels of soil contamination. The clay-zone temperatures increased to 1,000 C after 8 days of heating and were maintained near 1,000 C for 17 days. Electrical heating removed 17,000 gal of water from the soil as steam, with peak removal rate of 1,500 gpd of condensed steam.

198 (PNL-SA-24081) In situ soil remediation using electrokinetics. Buehler, M.F.; Surma, J.E.; Virden, J.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1994, 34p. Sponsored by USDOE, Washington, DC (United States); Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941124-16: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007283. Source: OSTI; NTIS; INIS; GPO Dep.

Electrokinetics is emerging as a promising technology for in situ soil remediation. This technique is especially attractive for Superfund sites and government operations which contain large volumes of contaminated soil. The approach uses an applied electric field to induce transport of both radioactive and hazardous waste ions in soil. The transport mechanisms include electroosmosis, electromigration, and electrophoresis. The feasibility of using electrokinetics to move radioactive ^{137}Cs and ^{60}Co at the Hanford Site in Richland, Washington, is discussed. A closed cell is used to provide in situ measurements of ^{137}Cs and ^{60}Co movement

in Hanford soil. Preliminary results of ionic movement, along with the corresponding current response, are presented.

199 (PNL-SA-24087) **Enhancing the design of in situ chemical barriers with multicomponent reactive transport modeling.** Sevougian, S.D.; Steefel, C.I.; Yabusaki, S.B. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-13: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007267. Source: OSTI; NTIS; INIS; GPO Dep.

This paper addresses the need for systematic control of field-scale performance in the emplacement and operation of in situ chemical treatment barriers; in particular, it addresses the issue of how the local coupling of reaction kinetics and material heterogeneities at the laboratory or bench scale can be accurately upscaled to the field. The authors have recently developed modeling analysis tools that can explicitly account for all relevant chemical reactions that accompany the transport of reagents and contaminants through a chemically and physically heterogeneous subsurface rock or soil matrix. These tools are incorporated into an enhanced design methodology for in situ chemical treatment technologies, and the new methodology is demonstrated in the ongoing design of a field experiment for the In Situ Redox Manipulation (ISRM) project at the U.S. Department of Energy (DOE) Hanford Site. The ISRM design approach, which systematically integrates bench-scale and site characterization information, provides an ideal test for the new reactive transport techniques. The need for the enhanced chemistry capability is demonstrated by an example that shows how intra-aqueous redox kinetics can affect the transport of reactive solutes. Simulations are carried out on massively parallel computer architectures to resolve the influence of multiscale heterogeneities on multicomponent, multidimensional reactive transport. The technology will soon be available to design larger-scale remediation schemes.

200 (PNL-SA-24094) **Selective, high-energy beta scintillation sensor for real-time, in situ characterization of uranium-238 and strontium-90.** Schilk, A.J.; Abel, K.H.; Brown, D.P.; Thompson, R.C.; Knopf, M.A.; Hubbard, C.W. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940401-11: International conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 10-16 Apr 1994). Order Number DE94013325. Source: OSTI; NTIS; INIS; GPO Dep.

A novel scintillating-fiber sensor for detecting high-energy beta particles has been designed and built at the Pacific Northwest Laboratory to characterize ^{238}U and ^{90}Sr in surface soils. High-energy betas generate unique signals as they pass through multiple layers of scintillating fibers that make up the active region of the detector. Lower-energy beta particles, gamma rays, and cosmic-ray-generated particles comprise the majority of the background interferences. The resulting signals produced by these latter phenomena are effectively discriminated against due to the combination of the sensor's multi-layer configuration and its interlayer coincidence/anti-coincidence circuitry.

201 (PNL-SA-24120) **Real-time, in situ detection of ^{90}Sr and ^{238}U in soils via scintillating-fiber-sensor technology.** Schilk, A.J.; Knopf, M.A.; Thompson, R.C.; Hubbard, C.W.; Abel, K.H.; Edwards, D.R.; Abraham, J.R. Pacific Northwest Lab., Richland, WA (United States). May 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940524-15: 8. symposium on radiation measurements and applications, Ann Arbor, MI (United States), 16-19 May 1994). Order Number DE94016987. Source: OSTI; NTIS; INIS; GPO Dep.

A revolutionary sensor has been developed for observing the highly energetic beta particles that originate from the decay daughters of ^{238}U and ^{90}Sr . This is accomplished through (1) constructing flat ribbons that are each composed of numerous square scintillating fibers, (2) stacking these ribbons and coupling each bundled end to a photomultiplier tube, and (3) using custom-designed electronic circuitry to measure both interlayer and intralayer coincident events. By observing the relative penetration depths of incident particles, this sensor is able to discriminate between the highly energetic betas of interest and those of lower energy. After placing the sensor on the target surface and initiating data acquisition, one obtains in a few seconds to a few minutes an accurate indication of the contaminant activity per unit weight of material (in the uppermost millimeters) directly below the sensor. This combination of speed and efficiency allows rapid surface coverage in a relatively short period of time, thereby facilitating the timely removal of these contaminants. Laboratory evaluations of a prototype version of this sensor have indicated that contamination levels less than 5 pCi/g (1.8×10^2 Bq/kg) can be determined within a few minutes.

202 (PNL-SA-24123) **Erace—an integrated system for treating organic-contaminated sites.** Caley, S.M.; Heath, W.O.; Bergsman, T.M.; Gauglitz, P.A.; Pillay, C.; Moss, R.W.; Shah, R.R.; Goheen, S.C.; Camiaoni, D.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-17: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007280. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's (DOE) Pacific Northwest Laboratory (PNL) is developing a suite of electrical technologies for treating sites contaminated with hazardous organic compounds. These include: (1) Six-Phase Soil Heating (SPSH) to remove volatile and semi-volatile organic compounds from soils; (2) In Situ Corona (ISC) to decompose nonvolatile and bound organic contaminants in soils; (3) High-Energy Corona (HEC) to treat contaminated off-gases; and (4) Liquid Corona (LC) to treat contaminated liquids. These four technologies comprise ERACE (Electrical Remediation at Contaminated Environments), an integrated system for accomplishing site remediation with little or no secondary wastes produced that would require off-site treatment or disposal. Each ERACE technology can be employed individually as a stand-alone treatment process, or combined as a system for total site remediation. For example, an ERACE system for treating sites contaminated with volatile organics would integrate SPSH to remove the contaminants from the soil, LC to continuously treat an aqueous stream condensed out of the soil off-gas, and HEC to treat

non-condensibles remaining in the off-gas, before atmospheric release.

203 (PNL-SA-24159) The role of plants on isolation barrier systems. Link, S.O. (Pacific Northwest Lab., Richland, WA (United States)); Downs, J.L.; Waugh, W.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-18; 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007756. Source: OSTI; NTIS; INIS; GPO Dep.

Surface barriers are used to isolate buried wastes from the environment. Most have been built for short-term isolation. The need to isolate radioactive wastes from the environment requires that the functional integrity of a barrier be maintained for thousands of years. Barrier function strongly depends on vegetation. Plants reduce wind and water erosion and minimize drainage, but may transport contaminants if roots extend into buried wastes. Our review of the function of plants on surface barriers focuses on the role of plants across mesic to arid environments and gives special consideration to studies done at Hanford. The Hanford Barrier Development Program was created to design and test an earthen cover system to inhibit water infiltration, plant and animal intrusion, and wind and water erosion, while isolating buried wastes for at least 1000 years. Studies at the Hanford have shown that plants will significantly interact with the barrier. Plants transpire soil water back into the atmosphere. Deep-rooted perennials best recycle water; soil water may drain through the root zone of shallow-rooted annuals. Lysimeter studies indicate that a surface layer of fine soil with deep-rooted plants precludes drainage even with three times normal precipitation. The presence of vegetation greatly reduces water and wind erosion, but deep-rooted plants pose a threat of biointrusion and contaminant transport. The Hanford barrier includes a buried rock layer and asphalt layer to prevent biointrusion.

204 (PNL-SA-24222) Models for recurrent gas release event behavior in hazardous waste tanks. Anderson, D.N. (Pacific Northwest Lab., Richland, WA (United States)); Arnold, B.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940806-1: 6. international congress of ecology: ecological progress to meet the challenge of environmental change, Manchester (United Kingdom), 20-26 Aug 1994). Order Number DE95004902. Source: OSTI; NTIS; INIS; GPO Dep.

Certain radioactive waste storage tanks at the United States Department of Energy Hanford facilities continuously generate gases as a result of radiolysis and chemical reactions. The congealed sludge in these tanks traps the gases and causes the level of the waste within the tanks to rise. The waste level continues to rise until the sludge becomes buoyant and "rolls over", changing places with heavier fluid on top. During a rollover, the trapped gases are released, resulting in a sudden drop in the waste level. This is known as a gas release event (GRE). After a GRE, the wastes leading to another GRE. We present nonlinear time waste re-congeals and gas again accumulates leading to another GRE. We present nonlinear time series models that produce simulated sample paths that closely resemble the temporal

history of waste levels in these tanks. The models also imitate the random GRE, behavior observed in the temporal waste level history of a storage tank. We are interested in using the structure of these models to understand the probabilistic behavior of the random variable "time between consecutive GRE's". Understanding the stochastic nature of this random variable is important because the hydrogen and nitrous oxide gases released from a GRE, are flammable and the ammonia that is released is a health risk. From a safety perspective, activity around such waste tanks should be halted when a GRE is imminent. With credible GRE models, we can establish time windows in which waste tank research and maintenance activities can be safely performed.

205 (PNL-SA-24297) Overview of technology modeling in the Remedial Action Assessment System (RAAS). Johnson, C.D.; Bagaasen, L.M.; Chan, T.C.; Lamar, D.A.; Buel, J.L.; Freeman, C.J.; Skeen, R.S. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-82: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017464. Source: OSTI; NTIS; INIS; GPO Dep.

There are numerous hazardous waste sites under the jurisdiction of the US Department of Energy (DOE). To assist the cleanup of these sites in a more consistent, timely, and cost-effective manner, the Remedial Action Assessment System (RAAS) is being developed by the Pacific Northwest Laboratory (PNL). RAAS is a software tool designed to automate the initial technology selection within the remedial investigation/feasibility study (RI/FS) process. The software does several things for the user: (1) provides information about available remedial technologies, (2) sorts possible technologies to recommend a list of technologies applicable to a given site, (3) points out technical issues that may prevent the implementation of a technology, and (4) provides an estimate of the effectiveness of a given technology at a particular site. Information from RAAS can be used to compare remediation options and guide selection of technologies for further study.

206 (PNL-SA-24298) Six-phase soil heating accelerates VOC extraction from clay soil. Gauglitz, P.A. (Pacific Northwest Lab., Richland, WA (United States)); Roberts, J.S.; Bergsman, T.M.; Caley, S.M.; Heath, W.O.; Miller, M.C.; Moss, R.W.; Schalla, R.; Jarosch, T.R.; Eddy-Dilek, C.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-99: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94019186. Source: OSTI; NTIS; INIS; GPO Dep.

Six-Phase Soil Heating (SPSH) was demonstrated as a viable technology for heating low permeability soils containing volatile organic contaminants. Testing was performed as part of the Volatile Organic Compounds in Non-Arid Soils Integrated Demonstration (VOC Non-Arid ID) at the Savannah River Site. The soil at the integrated demonstration site is contaminated with perchloroethylene (PCE) and trichloroethylene (TCE); the highest soil contamination occurs in clay-rich zones that are ineffectively treated by conventional soil vapor extraction due to the very low permeability of the clay. The SPSH demonstration sought to

heat the clay zone and enhance the performance of conventional soil vapor extraction. Thermocouples at thirty locations quantified the areal and vertical heating within the treated zone. Soil samples were collected before and after heating to quantify the efficacy of heat-enhanced vapor extraction of PCE and TCE from the clay soil. Samples were taken (essentially every foot) from six wells prior to heating and adjacent to these wells after heating. Results show that contaminant removal from the clay zone was 99.7% (median) within the electrode array. Outside the array where the soil was heated, but to only 50°C, the removal efficiency was 93%, showing that heating accelerated the removal of VOCs from the clay soil. The accelerated remediation resulted from effective heating of the contaminated clay zone by SPSH. The temperature of the clay zone increased to 100°C after 8 days of heating and was maintained near 100°C for 17 days. Electrical heating removed 19,000 gal of water from the soil as steam, with peak removal rate of 1,500 gpd of condensed steam.

207 (PNL-SA-24315) Innocuous oil as an additive for reductive reactions involving zero valence iron. Cary, J.W.; Cantrell, K.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-12: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007159. Source: OSTI; NTIS; INIS; GPO Dep.

Reductive reactions involving zero valence iron appear to hold promise for in situ remediation of sites containing chlorinated hydrocarbon solvents and certain reducible metals and radionuclides. Treatment involves the injection of metallic iron and the creation of low levels of dissolved oxygen in the aqueous phase through oxidation of the metallic iron. The use of a biodegradable immiscible and innocuous organic liquid such as vegetable oil as an additive offers several intriguing possibilities. The oil phase creates a large oil-water interface that is immobile with respect to flow in the aqueous phase. This phase will act as a trap for chlorinated hydrocarbons and could potentially increase the reaction efficiency of reductive dehalogenation of chlorinated hydrocarbons by the metallic iron. When iron particles are suspended in the oil before injection they are preferentially held in the oil phase and tend to accumulate at the oil-water interface. Thus oil injection can serve as a mechanism for creating a stable porous curtain of metallic iron in the vadose to maintain a low oxygen environment which will minimize the consumption of the iron by molecular oxygen.

208 (PNL-SA-24336) Integrated environmental monitoring – prototype demonstration. Bryce, R.W.; Vail, L.W.; Hostetler, D.D.; Meyer, P.D.; Carlson, T.J.; Miller, P.L. Pacific Northwest Lab., Richland, WA (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9405183-1: 6. national technical information exchange workshop, Kennewick, WA (United States), 10-12 May 1994). Order Number DE94014445. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater monitoring is an important activity at US Department of Energy (DOE) sites. Monitoring programs at DOE facilities have evolved in response to operational needs at the facilities, public outcries for information, regulatory requirements, DOE orders, and improvements in monitoring technology. Decisions regarding sampling location, sampling frequency, analyses performed, and other

aspects of monitoring network design can have major implications for detecting releases and for making subsequent higher level decisions about facility operation and remediation. The Integrated Environmental Monitoring (IEM) concept is a set of analytical procedures and software tools that can be used to improve monitoring network design decisions. Such decisions include the choice of monitoring locations, sampling frequencies, sensor technologies, and monitored constituents. IEM provides a set of monitoring alternatives that balance the tradeoffs between competing monitoring objectives such as the minimization of cost and the minimization of uncertainty. The alternatives provided are the best available with respect to the monitoring objectives, consistent with the physical and chemical characteristics of the site, and consist with applicable regulatory requirements. The selection of the best monitoring alternative to implement is made by the stakeholders after reviewing the alternatives and tradeoffs produced by the IEM process.

209 (PNL-SA-24355) Declustering and stochastic simulation of ground-water tritium concentrations at Hanford, Washington. Rossi, R.E.; Dresel, P.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950159-1: Workshop and symposium on geostatistics for geotechnical and environmental applications, Phoenix, AZ (United States), 26-27 Jan 1995). Order Number DE95007161. Source: OSTI; NTIS; INIS; GPO Dep.

Monitoring and characterization of radionuclides and hazardous chemicals in ground water are ongoing activities at the U.S. Department of Energy's (DOE) Hanford Site in south-central Washington State. These activities are conducted to assess the impacts of Site operations on public health and the environment, to comply with the Resource Conservation and Recovery Act (RCRA), and for characterization of sites under the Comprehensive Environmental Resource Compensation and Liability Act (CERCLA). Periodic measurement and sampling of approximately 720 wells provides site-specific information about hydraulic head and contaminant concentrations. These data are then used to infer ground-water flow directions and gradients for the interpretation of contaminant transport. Tritium, a by-product of nuclear materials production, is the most wide-spread radionuclide contaminant on site. Identification of tritium concentrations above the Drinking Water Standard (DWS) of 20,000 pCi/L are of particular concern. However, due to preferential location of monitoring wells near historical production sites, a disproportionately large number of samples originate in higher concentration areas. Consequently, univariate as well as bivariate (spatial) statistics like the variogram need to be adjusted to account for the preferential sampling. Such "declustering" of the samples is necessary to appraise the actual proportions above or below any cutoff (e.g., the DWS) and to accurately map or simulate tritium at unsampled locations.

210 (PNL-SA-24388) Hanford Permanent Isolation Barrier Program: Asphalt technology development. Freeman, H.D.; Romine, R.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-21: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007816. Source: OSTI; NTIS; INIS; GPO Dep.

An important component of the Hanford Permanent Isolation Barrier is the use of a two-layer composite asphalt system, which provides backup water diversion capabilities if the primary capillary barrier fails to meet infiltration goals. Because of asphalt's potential to perform to specification over the 1000-year design life criterion, a composite asphalt barrier (HMAC/fluid-applied polymer-modified asphalt) is being considered as an alternative to the bentonite clay/high density poly(ethylene) barriers for the low-permeability component of the Hanford Permanent Isolation Barrier. The feasibility of using asphalt as a long-term barrier is currently being studied. Information that must be known is the ability of asphalt to retain desirable physical properties over a period of 1000 years. This paper presents the approach for performing accelerated aging tests and evaluating the performance of samples under accelerated conditions. The results of these tests will be compared with asphalt artifact analogs and the results of modeling the degradation of the selected asphalt composite to make life-cycle predictions.

211 (PNL-SA-24403) In situ remediation: Developing containment technologies. Peterson, M. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-83: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017479. Source: OSTI; NTIS; INIS; GPO Dep.

The In Situ Remediation Integrated Program (ISR IP) was established by the US Department of Energy's (DOE) Office of Technology Development (OTD) to advance the state-of-the-art of innovative in situ remediation technologies to the point of demonstration, and to broaden the applicability of these technologies to the widely varying site remediation requirements throughout the DOE complex. This program complements ongoing demonstration programs being conducted at several DOE sites. The ISR-IP has been conducting baseline assessments of in situ technologies to support program planning. One of the assessments has focused on evaluating subsurface containment barrier technologies to identify the current state-of-the-art and determine R and D requirements to enable the deployment of these technologies. DOE's needs are mostly driven by issues concerning the large number of sites requiring remediation, the wide variation among the sites themselves, and the broad range of contaminants at these sites. Many of the sites contain a mixture of organic and inorganic hazardous waste and radioactive waste in a variety of media. Current remedial action strategies for hazardous waste sites are considering containment mostly as an interim action to prevent migration of contaminants from the site until a Record of Decision is made. In some cases, containment is also considered as a remedial action alternative where it is determined to be the best compromise between cost and effectiveness over a relatively short period of time (about 30 years).

212 (PNL-SA-24432) Development and analysis of High-Energy Corona process for air purification. Heath, W.O.; Barlow, S.E.; Bergsman, T.M.; Lessor, D.L.; Orlando, T.M.; Peurrung, A.J.; Shah, R.R. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9406143-1: 1. international conference on advanced oxidation technologies for water and air remediation, London (Canada), 25-30 Jun 1994). Order Number DE94015207. Source: OSTI; NTIS; GPO Dep.

This paper gives an overview of the High-Energy Corona (HEC) technology being developed for treating air and other gas streams, summarizes results of an initial field test of the HEC process and follow-up laboratory experiments, and outlines the progress and approach toward better understanding of the underlying physical and chemical mechanisms to guide further development. The High-Energy Corona process uses high-voltage ac fields developed in a packed bed of dielectric pellets to form a nonequilibrium plasma in the void spaces between the pellets. The pellets refract the electric fields, creating extremely high field strengths capable of initiating electron-impact ionization of the air (and contaminants). The present-generation HEC device is a coaxial cylinder with an inner metal electrode, an outer tube made of glass, and dielectric pellets filling the annular gap. A metal foil or screen in contact with the outside surface of the tube serves as the ground electrode. The inner electrode is connected to a high-voltage (25 to 30 kV) ac power supply operated at a fixed frequency of 60 Hz. The glass tube serves as the reaction vessel and as a dielectric barrier to inhibit direct charge transfer between electrodes. The gas to be treated is simply pulled through the packed bed where reactant species are produced and subsequent chemical reactions occur. Thus, far, the HEC process has been effective in destroying trichloroethylene, perchloroethylene, carbon tetrachloride, benzene, and heptane in the gas phase and naphthalene in the liquid phase. Further tests are planned with other compounds.

213 (PNL-SA-24438) Public participation in the evaluation of innovative environmental cleanup technology. Peterson, T. (Battelle Seattle Research Center, WA (United States)); McCabe, G.; Serie, P.; Niesen, K. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-90: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017798. Source: OSTI; NTIS; INIS; GPO Dep.

Technologies for remediation of contamination are urgently needed to clean up US Department of Energy (DOE) sites across the country. DOE is managing a national program to develop, demonstrate, and deploy new technologies with promise to expedite this cleanup. The Integrated Demonstration for Cleanup of Volatile Organic Compounds at Arid Sites (VOC-Arid ID) is one such effort. Time and resources, however, are too limited to be invested in methods of remediation that will never be deployed because they have not been rigorously evaluated or because they face the withering opposition of stakeholders. Therefore the VOC-Arid ID is assessing technology both in terms of its technical effectiveness and its stakeholder acceptability. Only if a technology performs as required and is acceptable to regulators, users of technology, and the public will the VOC-Arid ID recommend its use. What distinguishes public involvement in the VOC-Arid ID is the direct influence stakeholders have on the design of technology demonstrations by working directly with technology developers. Stakeholders participated in defining the criteria with which innovative environmental cleanup technology is being evaluated. The integrated demonstration is committed to providing stakeholders with the information they've indicated they need to reach reasoned judgments about the use of specific cleanup technologies. A guiding principle of the VOC-Arid ID is that stakeholder participation improves the technologies being developed, enhances the acceptance of the technologies,

and will lead to the broad and timely deployment of appropriate and effective methods of environmental remediation. The VOC-Arid ID has involved stakeholders from the host demonstration site, Hanford, Washington, and from other and sites where the ID technologies may be deployed.

214 (PNL-SA-24505) Abiotic reduction of aquifer materials by dithionite: A promising in-situ remediation technology. Amonette, J.E. (Pacific Northwest Lab., Richland, WA (United States)); Szecsody, J.E.; Schaef, H.T.; Gorby, Y.A.; Fruchter, J.S.; Templeton, J.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-22: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007812. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory batch and column experiments were conducted with Hanford sediments to develop the capability to predict (1) the longevity of dithionite in these systems, (2) its efficiency as a reductant of structural iron, and (3) the longevity and reactivity of the reduced iron with soluble inorganic and organic species. After an initial induction period, the loss of dithionite by disproportionation and oxidation could be described by pseudo-first-order (PFO) kinetics. Other than the initial reaction with ferric iron, the primary factor promoting loss of dithionite in this system was disproportionation via heterogeneous catalysis at mineral surfaces. The efficiency of the reduction of structural iron was nearly 100% for the first fourth of the ferric iron, but declined exponentially with higher degrees of reduction so that 75% of the ferric iron could be reduced. This decrease in reduction efficiency probably was related to differences in the accessibility of ferric iron in the mineral particles, with iron in clay-sized particles being the most accessible and that in silt- and sand-sized particles less accessible. Flow-through column studies showed that a reduced-sediment barrier created in this manner could maintain a reducing environment.

215 (PNL-SA-24564) In situ remediation integrated program: Success through teamwork. Peterson, M.E. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-85: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017455. Source: OSTI; NTIS; INIS; GPO Dep.

The In Situ Remediation Integrated Program (ISR IP), managed under the US Department of Energy's (DOE) Office of Technology Development, focuses research and development efforts on the in-place treatment of contaminated environmental media, such as soil and groundwater, and the containment of contaminants to prevent the contaminants from spreading through the environment. As described here, specific ISR IP projects are advancing the application of in situ technologies to the demonstration point, providing developed technologies to customers within DOE. The ISR IP has also taken a lead role in assessing and supporting innovative technologies that may have application to DOE.

216 (PNL-SA-24565) In situ remediation integrated program: Development of containment technology. Peterson, M.E. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-80: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017457. Source: OSTI; NTIS; INIS; GPO Dep.

The In Situ Remediation Integrated Program (ISR IP) is supporting the development of subsurface containment barrier technology for use in site restoration applications at contaminated sites throughout the US Department of Energy (DOE) complex. The types of subsurface barriers being developed include impermeable barriers and sorbent barriers. The specific containment technology projects described in this paper include frozen soil barriers, flowable grout techniques, hydraulic and diffusion barriers, horizontal grout barriers, chemically enhanced barriers, and viscous liquid barriers.

217 (PNL-SA-24702) The UFA technology for characterization of in situ barrier materials. Wright, J. (Pacific Northwest Lab., Richland, WA (United States)); Conca, J.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States); Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC06-76RL01830. (CONF-941124-15: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007284. Source: OSTI; NTIS; GPO Dep.

Site characterizations, choices of remedial strategies for site restoration, and performance assessments of chosen strategies all require knowledge of the transport properties for subsurface materials, such as hydraulic conductivities, diffusion coefficients, sorption properties, and in situ recharge rates. Unsaturated conditions in the vadose zone are especially difficult to investigate because of the extreme variability in the transport properties of geologic materials as a function of water content. A new technique, the Unsaturated Flow Apparatus (UFA), was developed to rapidly attain hydraulic steady-state in all porous/fractured media, including multicomponent/multiphase systems. The larger driving forces obtainable with centrifugation techniques are combined with precision fluid flow through a rotating seal. Hydraulic steady state is achieved in a period of hours to days, instead of months to years, depending on the target water content and intrinsic permeability of the material. Barrier materials such as bentonite slurries, chemical barriers, cements, and asphalt concretes can be rapidly run in the UFA prior to emplacement to fine-tune formulations and identify any site-specific or substrate-specific problems that could not be identified without actual field testing.

218 (PNL-SA-24843) Interpretation and modeling of a subsurface injection test, 200 East Area, Hanford, Washington. Smoot, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Lu, A.H. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-19: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007752. Source: OSTI; NTIS; INIS; GPO Dep.

A tracer experiment was conducted in 1980 and 1981 in the unsaturated zone in the southeast portion of the Hanford 200 East Area near the Plutonium-Uranium Extraction

(PUREX) facility. The field design consisted of a central injection well with 32 monitoring wells within an 8-m radius. Water containing radioactive and other tracers was injected weekly during the experiment. The unique features of the experiment were the documented control of the inputs, the experiment's three-dimensional nature, the in-situ measurement of radioactive tracers, and the use of multiple injections. The spacing of the test wells provided reasonable lag distribution for spatial correlation analysis. Preliminary analyses indicated spatial correlation on the order of 400 to 500 cm in the vertical direction. Previous researchers found that two-dimensional axisymmetric modeling of moisture content generally underpredicts lateral spreading and overpredicts vertical movement of the injected water. Incorporation of anisotropic hydraulic properties resulted in the best model predictions. Three-dimensional modeling incorporated the geologic heterogeneity of discontinuous layers and lenses of sediment apparent in the site geology. Model results were compared statistically with measured experimental data and indicate reasonably good agreement with vertical and lateral field moisture distributions.

219 (PNL-SA-25345) A solubility model for amorphous silica in concentrated electrolytes. Felmy, A.R.; Schroeder, C.C.; Mason, M.J. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940813-33: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95004896. Source: OSTI; NTIS; GPO Dep.

Silica is one of the major constituents of the earth's crust and is ubiquitously present in most natural materials. The solubility of silica and other silica-containing compounds is, therefore, of primary concern in geochemistry and in chemical processing applications where silica scale formation, resulting from changes in temperature and electrolyte composition, can cause problems in process design and operation. This paper describes the development of an aqueous thermodynamic model for accurately predicting the solubility of amorphous silica and other silica-containing compounds in the system $\text{Na}^+\text{-H}^+\text{-Mg}^{2+}\text{-NO}_3^-\text{-SO}_4^{2-}\text{-Cl}^-\text{-H}_2\text{O}$ to high concentration and across the temperature range 25–100 C. This model, which utilizes the aqueous thermodynamic model of Pitzer, includes only one dissolved silica species, $\text{H}_4\text{SiO}_4(\text{aq})$, and is valid in neutral to very acidic solutions. The model is parameterized from the extensive set of solubility data in the literature as well as from new experimental data on amorphous silica solubility in HNO_3 and HCl developed as part of this study. The accuracy of the model is tested on solutions more complex than those used in model parameterization.

220 (PNL-SA-25469) Remediation of contaminated subsurface materials by a metal-reducing bacterium. Gorby, Y.A.; Amonette, J.E.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-10: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95004924. Source: OSTI; NTIS; INIS; GPO Dep.

A biotic approach for remediating subsurface sediments and groundwater contaminated with carbon tetrachloride

(CT) and chromium was evaluated. Cells of the Fe(III) -reducing bacterium strain BrY were added to sealed, anoxic flasks containing Hanford groundwater, natural subsurface sediments, and either carbon tetrachloride, CT, or oxidized chromium, Cr(VI) . With lactate as the electron donor, BrY transformed CT to chloroform (CF), which accumulated to about 10 % of the initial concentration of CT. The remainder of the CT was transformed to unidentified, nonvolatile compounds. Transformation of CT by BrY was an indirect process. Cells reduced solid phase Fe(III) to chemically reactive Fe(II) that chemically transformed the chlorinated contaminant. Cr(VI) , in contrast, was reduced by a direct enzymatic reaction in the presence or absence of Fe(III) -bearing sediments. These results demonstrate that Fe(III) -reducing bacteria provide potential for transforming CT and for reducing Cr(VI) to less toxic Cr(III) . Technologies for stimulating indigenous populations of metal-reducing bacteria or for introducing specific metal-reducing bacteria to the subsurface are being investigated.

221 (PNL-SA-25615) Dual-gas tracers for subsurface characterization and NAPL detection. Gauglitz, P.A.; Peurrung, L.M.; Mendoza, D.P.; Pillay, G. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411183-1: 2. tracer workshop, Austin, TX (United States), 14-15 Nov 1994). Order Number DE95005961. Source: OSTI; NTIS; INIS; GPO Dep.

Effective design of in situ remediation technologies often requires an understanding of the mass transfer limitations that control the removal of contaminants from the soil. In addition, the presence of nonaqueous phase liquids (NAPLs) in soils will affect the ultimate success or failure of remediation processes. Knowing the location of NAPLs within the subsurface is critical to designing the most effective remediation approach. This work focuses on demonstrating that gas tracers can detect the location of the NAPLs in the subsurface and elucidating the mass transfer limitations associated with the removal of contaminants from soils.

222 (PNL-SA-25864) The value of adding regional to local stakeholder involvement in evaluating the acceptability of innovative technologies. Peterson, T.S. (Pacific Northwest Lab., Richland, WA (United States)); McCabe, G.; Niesen, K.; Serie, P. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-116: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008937. Source: OSTI; NTIS; INIS; GPO Dep.

Technology is urgently needed to clean up contamination by volatile organic compounds at United States Department of Energy (DOE) sites. In many cases, however, existing technology is too slow, inefficient, or expensive. The record of technology development is, in some cases, similarly disappointing. Remediation technologies developed at great expense and evaluated piecemeal over long periods have not been deployed because, in the end, the public judged them ineffective or unacceptable. The need for successful methods of remediation is too great and resources too limited to continue with ineffective technology evaluation. In order to make good decisions about which technologies to deploy, remedial project managers need to know stakeholders' requirements for the performance of proposed technologies. Expanding stakeholder involvement regionally

identifies the concerns of a broad range of stakeholders at and DOE sites throughout the West — issues that must be taken into account if technologies are to be accepted for wide deployment.

223 (RFP-4900) Adsorption study for uranium in Rocky Flats groundwater. Laul, J.C. (EG and G Rocky Flats, Inc., Golden, CO (United States)); Rupert, M.C.; Harris, M.J.; Duran, A. EG and G Rocky Flats, Inc., Golden, CO (United States). Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-950570-7: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006141. Source: OSTI; NTIS; INIS; GPO Dep.

Six adsorbents were studied to determine their effectiveness in removing uranium in Rocky Flats groundwater. The bench column and batch (Kd) tests showed that uranium can be removed (>99.9%) by four adsorbents. Bone Charcoal (R1O22); F-1 Alumina (granular activated alumina); BIOFIX (immobilized biological agent); SOPBPLUS (mixed metal oxide); Filtrasorb 300 (granular activated carbon); and Zeolite (clinoptilolite).

224 (SAND-91-1526) Benchmark testing and independent verification of the VS2DT computer code. McCord, J.T. (Sandia National Labs., Albuquerque, NM (United States). Environmental Risk Assessment and Risk Management Dept.); Goodrich, M.T. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95004386. Source: OSTI; NTIS; INIS; GPO Dep.

The finite difference flow and transport simulator VS2DT was benchmark tested against several other codes which solve the same equations (Richards equation for flow and the Advection-Dispersion equation for transport). The benchmark problems investigated transient two-dimensional flow in a heterogeneous soil profile with a localized water source at the ground surface. The VS2DT code performed as well as or better than all other codes when considering mass balance characteristics and computational speed. It was also rated highly relative to the other codes with regard to ease-of-use. Following the benchmark study, the code was verified against two analytical solutions, one for two-dimensional flow and one for two-dimensional transport. These independent verifications show reasonable agreement with the analytical solutions, and complement the one-dimensional verification problems published in the code's original documentation.

225 (SAND-93-0681) Sandia National Laboratories site-wide hydrogeologic characterization project calendar year 1992 annual report. Crowson, D. (and others); Gibson, J.D.; Haase, C.S.; Holt, R.; Hyndman, D.; Krumhansl, J.; Lauffer, F.; McCord, J.P.; McCord, J.T.; Neel, D. Sandia National Labs., Albuquerque, NM (United States). Oct 1993. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94015597. Source: OSTI; NTIS; GPO Dep.

The Sandia National Laboratories, New Mexico (SNL/NM) Site-Wide Hydrogeologic Characterization (SWHC) project has been implemented as part of the SNL/NM Environmental Restoration (ER) Program to develop the regional hydrogeologic framework and baseline for the approximately

100 mi of Kirtland Air Force Base (KAFB) and adjacent withdrawn public lands upon which SNL/NM has performed research and development activities. Additionally, the SWHC project will investigate and characterize generic hydrogeologic issues associated with the 172 ER sites owned by SNL/NM across its facilities on KAFB. As called for in the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) Part B permit agreement between the U.S. Environmental Protection Agency (EPA) as the permitter and the U.S. Department of Energy (DOE) and SNL/NM as the permittees, an annual report is to be prepared by the SWHC project team. This document serves two primary purposes: (1) to identify and describe the conceptual framework for the hydrogeologic system underlying SNL/NM and (2) to describe characterization activities undertaken in the preceding year that add to our understanding (reduce our uncertainties) regarding the conceptual and quantitative hydrogeologic framework. This SWHC project annual report focuses primarily on purpose 1, providing a summary description of the current "state of knowledge" of the Sandia National Laboratories/Kirtland Air Force Base (SNL/KAFB) hydrogeologic setting.

226 (SAND-94-0715C) Field measurements of soil air permeability at the Chemical Waste Landfill. Phelan, J.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941124-1: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94007739. Source: OSTI; NTIS; GPO Dep.

The disposal of liquid organic solvents in unlined pits at the Sandia National Laboratories Chemical Waste Landfill (CWL) has created an organic solvent vapor plume in the subsurface soils. The groundwater, at a depth of 485 feet below ground surface, shows contamination by the vapor plume. The primary strategy to remove the volatile organic constituents from the soil include methods based on vacuum vapor extraction technologies. These technologies utilize the physical process of inducing air flow through the soils, into an extraction well, and to the surface for collection and/or treatment. The ability of the soils to be ventilated by a vacuum vapor extraction system is primarily dependent on the permeability of the soil. However, soil stratigraphic layers can have different permeabilities due to the differences in soil texture (percentages of sand, silt, and clay) and soil structure (bulk density and pore size distribution). These differences can create local soil horizons that are preferentially ventilated. The less ventilated zones will prolong the removal of vapor phase contaminants. This will increase the time needed to reach the remediation cleanup levels. Air permeability estimates at sequential depth horizons would provide valuable design input for segmented well screen completion zones that may improve removal efficiency of vacuum vapor extraction systems. Soil permeability characterization can be accomplished in many ways including laboratory tests, field scale tests, and reference to analogous soil texture properties. The work presented here represents an evaluation of soil permeability test methods at selected locations of the CWL.

227 (SAND-94-0716C) Thermal enhanced vapor extraction systems: Design, application and performance prediction including contaminant behavior.

Phelan, J.M.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1994]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941124-2: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94008615. Source: OSTI; NTIS; INIS; GPO Dep.

Soil heating technologies have been proposed as a method to accelerate contaminant removal from subsurface soils. These methods include the use of hot air, steam, conductive heaters, in-situ resistive heating and in-situ radiofrequency heating (Buettner et.al., EPA, Dev et.al., Heath et.al.). Criteria for selection of a particular soil heating technology is a complex function of contaminant and soil properties, and efficiency in energy delivery and contaminant removal technologies. The work presented here seeks to expand the understanding of the interactions of subsurface water, contaminant, heat and vacuum extraction through model predictions and field data collection. Field demonstration will involve the combination of two soil heating technologies (resistive and dielectric) with a vacuum vapor extraction system and will occur during the summer of 1994.

228 (SAND-94-0750C) **SEAMIST™ in-situ instrumentation and vapor sampling system applications in the Sandia Mixed Waste Landfill Integrated Demonstration Program.** Lowry, W.E. (Science and Engineering Associates, Inc., Santa Fe, NM (United States)); Dunn, S.D.; Cremer, S.C.; Williams, C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931095-82: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94008869. Source: OSTI; NTIS; INIS; GPO Dep.

The SEAMIST™ inverting membrane deployment system has been used successfully at the Mixed Waste Landfill Integrated Demonstration (MWLID) for multipoint vapor sampling/pressure measurement/permeability measurement/sensor integration demonstrations and borehole lining. Several instruments were deployed inside the SEAMIST™ lined boreholes to detect metals, radionuclides, moisture, and geologic variations. The liner protected the instruments from contamination, maintained support of the uncased borehole wall, and sealed the total borehole from air circulation. The current activities have included the installation of three multipoint vapor sampling systems and sensor integration systems in 100-foot-deep vertical boreholes. A long term pressure monitoring program has recorded barometric pressure effects at depth with relatively high spatial resolution. The SEAMIST™ system has been integrated with a variety of hydrologic and chemical sensors for in-situ measurements, demonstrating its versatility as an instrument deployment system which allows easy emplacement and removal. Standard SEAMIST™ vapor sampling systems were also integrated with state-of-the-art VOC analysis technologies (automated GC, UV laser fluorometer). The results and status of these demonstration tests are presented.

229 (SAND-94-0805C) **Thermodynamic modeling of neptunium(V) solubility in concentrated Na-CO₃-HCO₃-Cl-ClO₄-H-OH-H₂O systems.** Novak, C.F. (Sandia National Labs., Albuquerque, NM (United States)); Roberts, K.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000.

(CONF-941075-2: 18. international symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE95001605. Source: OSTI; NTIS; INIS; GPO Dep.

Safety assessments of nuclear waste repositories often require estimation of actinide solubilities as a function of groundwater composition. Although considerable amount of research has been done on the solubility and speciation of actinides, relatively little has been done to unify these data into a model applicable to concentrate brines. Numerous authors report data on the aqueous chemical properties of Np(V) in NaClO₄, Na₂CO₃, and NaCl media, but a consistent thermodynamic model for predicting these properties is not available. To meet this need, a model was developed to describe the solubility of Np(V) in Na-Cl-ClO₄-CO₃ aqueous systems, based on the Pitzer activity coefficient formalism for concentrated electrolytes. Hydrolysis and/or carbonate complexation are the dominant aqueous reactions with neptunyl in these systems. Literature data for neptunyl extraction and solubility, and solubility data that the authors developed, are used to parameterize an integrated model for Np(V) solubility in the Np(V)-Na-CO₃-HCO₃-Cl-ClO₄-H-OH-H₂O system. The resulting model is tested against additional solubility data, and compared with Np(V) solubility experiments in complex synthetic brines.

230 (SAND-94-0981) **Ranking of septic tank and drainfield sites using travel time to the groundwater table.** Langkopf, B.S. (Sandia National Labs., Albuquerque, NM (United States). Environmental Risk Assessment and Risk Management Dept.); McCord, J.T. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001111. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Program at Sandia National Laboratories, New Mexico (SNL/NM) is tasked with performing assessments and cleanup of waste sites that belong to SNL. SNL's waste sites are divided into several activities. Septic Tanks and Drainfields (STD) is an activity that includes 23 different sites at SNL/NM. All these sites may have released hazardous wastes into the soil from drains or sewers of buildings. The STD sites must be assessed and, if necessary, remediated according to the Resource Conservation and Recovery Act (RCRA) Corrective Action process. A modeling study has been completed to help prioritize the sites for future field investigation based on the risk that each site may pose to human health and the environment. Two of the influences on the risk to human health and environment are addressed in this study—the fluid disposal volume and groundwater depth. These two parameters, as well as several others, were used as input into a computer model to calculate groundwater travel time to the water table. The computer model was based on Darcy's Law and a simple mass balance. To account for uncertainty in the input parameters, a Monte Carlo approach was used to determine the travel times; 1,000 realizations were completed to determine the travel time for each site. The range assigned to each of the input parameters was sampled according to an assigned statistical distribution using the Latin Hypercube Method to arrive at input for the calculations. The groundwater travel times resulting from these calculations were used to rank the sites for future field investigation.

231 (SAND-94-0996C) **Geological investigations and hydrogeologic model development in support of DoD and DOE environmental programs on Kirtland Air**

Force Base, New Mexico, U.S.A. Gibson, J.D. (Sandia National Labs., Albuquerque, NM (United States)); Pratt, G.; Davidson, H.; DeWitt, C.; Hitchcock, C.; Kelson, K.; Noller, J.; Sawyer, T.; Thomas, E. Sandia National Labs., Albuquerque, NM (United States). 2 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940983-1: 2. international symposium and exhibition on environmental contamination in Central and Eastern Europe, Budapest (Hungary), 20-23 Sep 1994). Order Number DE94019181. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents results of preliminary geologic site characterization and hydrogeologic conceptual model development for the 250-km² Kirtland Air Force Base (KAFB) and associated lands in central New Mexico. The research, development, and other operational activities of the Department of Defense (DoD) and Department of Energy (DOE) on KAFB over the last 50 years have resulted in diverse hazardous, radioactive, and mixed-waste environmental concerns. Because multiple federal, state, and local agencies are responsible for administering the involved lands and because of the nature of many U.S. environmental regulations, individual contaminated and potentially contaminated DoD and DOE environmental restoration (ER) sites on KAFB are commonly handled as distinct entities with little consideration for the cumulative environmental and health risk from all sites. A site-wide characterization program has been undertaken at Sandia National Laboratories/New Mexico (SNL/NM), under the auspices of the DOE, to construct a conceptual hydrogeologic model for the base. This conceptual model serves as the basis for placing each ER site into a broader context for evaluating background (i.e., non-contaminated) conditions and for modeling of possible contaminant pathways and travel-times. Regional and local hydrogeologic investigations from KAFB can be used as models for characterizing and evaluating other sites around the world where combined civilian and military environmental programs must work together to resolve environmental problems that may present health risks to workers and the general public.

232 (SAND-94-1718C) In situ electrokinetic control of moisture and nutrients in unsaturated soils. Lindgren, E.R.; Brady, P.V. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950483-1: 3. international symposium on in situ and on-site bioreclamation, San Diego, CA (United States), 24-27 Apr 1995). Order Number DE95004527. Source: OSTI; NTIS; GPO Dep.

Many DOE facilities have unsaturated soils contaminated with metals and organic solvents. Because of the large volumes, in situ remediation is often the most economically attractive remediation technique. The success of many in situ treatment technologies depends critically on the degree to which the movement of water and desired ions can be engineered in the vadose zone. Bioremediation efforts in the vadose zone are limited by the ability to provide moisture and nutrients to contaminant-metabolizing microorganisms. An in situ electrokinetic remediation process has been developed at Sandia National Laboratories (SNL) for use in unsaturated soils, and is presently undergoing field demonstration. The electrokinetic process is not limited by low soil permeabilities and, therefore, provides a level of control not achievable by hydraulic means. Moisture is added to the

subsurface in a controlled fashion such that the field capacity is never exceeded, preventing the unwanted mobilization of dissolved contaminants by saturated wetting fronts. The Sandia electrokinetic process can potentially transport both water and nutrients for bioremediation efforts and is compatible with vapor phase in situ techniques such as bioventing. The approach should be as bioventing. The approach should lend itself to the directed transport of biodegradable chelating agents and complexed metals from contaminated soils.

233 (SAND-94-1958) In situ permeable flow sensors at the Savannah River Integrated Demonstration: Phase 2 results. Ballard, S. Sandia National Labs., Albuquerque, NM (United States). Aug 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94018517. Source: OSTI; NTIS; INIS; GPO Dep.

A suite of In Situ Permeable Flow Sensors was deployed at the site of the Savannah River Integrated Demonstration to monitor the interaction between the groundwater flow regime and air injected into the saturated subsurface through a horizontal well. One of the goals of the experiment was to determine if a groundwater circulation system was induced by the air injection process. The data suggest that no such circulation system was established, perhaps due to the heterogeneous nature of the sediments through which the injected gas has to travel. The steady state and transient groundwater flow patterns observed suggest that the injected air followed high permeability pathways from the injection well to the water table. The preferential pathways through the essentially horizontal impermeable layers appear to have been created by drilling activities at the site.

234 (SAND-94-2387) Casing pull tests for directionally drilled environmental wells. Staller, G.E. (Sandia National Labs., Albuquerque, NM (United States)); Wemple, R.P.; Layne, R.R. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95008152. Source: OSTI; NTIS; INIS; GPO Dep.

A series of tests to evaluate several types of environmental well casings have been conducted by Sandia National Laboratories (SNL) and its industrial partner, The Charles Machine Works, Inc. (CMW). A test bed was constructed at the CMW test range to model a typical shallow, horizontal, directionally drilled wellbore. Four different types of casings were pulled through this test bed. The loads required to pull the casings through the test bed and the condition of the casing material were documented during the pulling operations. An additional test was conducted to make a comparison of test bed vs actual wellbore casing pull loads. A directionally drilled well was emplaced by CMW to closely match the test bed. An instrumented casing was installed in the well and the pull loads recorded. The completed tests are reviewed and the results reported.

235 (SAND-94-2388) Final report for SNL/NM environmental drilling project. Wemple, R.P. (Sandia National Labs., Albuquerque, NM (United States)); Meyer, R.D.; Staller, G.E.; Layne, R.R. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95006502. Source: OSTI; NTIS; INIS; GPO Dep.

Concern for the environment and cost reduction are driving forces for a broad effort in government and the private

sector to develop new, more cost-effective technologies for characterizing, monitoring and remediating environmental sites. Secondary goals of the characterization, monitoring and remediation (CMR) activity are: minimize secondary waste generation, minimize site impact, protect water tables, and develop methods/strategies to apply new technologies. The Sandia National Laboratories (SNL) project in directional boring for CMR of waste sites with enhanced machinery from the underground utility installation industry was initiated in 1990. The project has tested a variety of prototype machinery and hardware built by the industrial partner, Charles Machine Works (CMW), and SNL at several sites (Savannah River Site (SRS), Hanford, SNL, Kirtland AFB (KAFB), CMW), successfully installed usable horizontal environmental test wells at SRS and SNL/KAFB, and functioned as a clearing house for information regarding application of existing commercial machinery to a variety of governmental and commercial sites. The project has continued to test and develop machinery in FY 94. The original goal of cost-effectiveness is being met through innovation, adaptation, and application of fundamental concepts. Secondary goals are being met via a basic philosophy of "cut/thrust and compact cuttings without adding large quantities of fluid" to an environmental problem site. This technology will be very cost-effective where applicable. Technology transfer and commercialization by CMW is ongoing and will continue into FY 95. Technology transfer to the private sector is ongoing and reflected in increasing machinery sales to environmental contractors. Education of regulatory agencies resulting in restructuring of appropriate regulatory standards for specification of the horizontal drilling techniques continues to be a long-range goal.

236 (SAND-94-3012) Summary of field operations Tijeras Arroyo Well TJA-2. Site-Wide Hydrogeologic Characterization Project. Foutz, W.L. (Lamb Associates, Inc., Albuquerque, NM (United States)); McCord, J.P. Sandia National Labs., Albuquerque, NM (United States); Lamb Associates, Inc., Albuquerque, NM (United States); INTERA, Inc., Albuquerque, NM (United States). Feb 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007759. Source: OSTI; NTIS; GPO Dep.

This report is a basic data report for field operations associated with the drilling, logging, completion, and development of Tijeras Arroyo well TJA-2. This test/monitoring well was installed as part of Sandia National Laboratories, New Mexico, Environmental Restoration Project.

237 (SAND-94-3123) Summary of field operations Technical Area I well PGS-1. Site-Wide Hydrogeologic Characterization Project. Fritts, J.E. (GRAM, Inc., Albuquerque, NM (United States)); McCord, J.P. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007760. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration (ER) Project at Sandia National Laboratories, New Mexico is managing the project to assess and, when necessary, to remediate sites contaminated by the lab operations. Within the ER project, the site-wide hydrogeologic characterization task is responsible for the area-wide hydrogeologic investigation. The purpose of this task is to reduce the uncertainty about the rate and direction of groundwater flow beneath the area and across its boundaries. This specific report deals with the installation of PGS-1 monitoring well which provides information on the

lithology and hydrology of the aquifer in the northern area of the Kirtland Air Force Base. The report provides information on the well design; surface geology; stratigraphy; structure; drilling, completion, and development techniques; and borehole geophysics information.

238 (SAND-95-0142C) Groundwater flow velocity measurements in a sinkhole at the Weeks Island Strategic Petroleum Reserve Facility, Louisiana. Ballard, S. (Sandia National Labs., Albuquerque, NM (United States)); Gibson, J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950450-1: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL (United States), 23-27 Apr 1995). Order Number DE95006825. Source: OSTI; NTIS; GPO Dep.

In 1992, a sinkhole was discovered above a Strategic Petroleum Reserve storage facility at Weeks Island, Louisiana. The oil is stored in an old salt mine located within a salt dome. In order to assess the hydrologic significance of the sink hole, an In Situ Permeable Flow Sensor was deployed within a sand-filled conduit in the salt dome directly beneath the sinkhole. The flow sensor is a recently developed instrument which uses a thermal perturbation technique to measure the magnitude and direction of the full 3-dimensional groundwater flow velocity vector in saturated, permeable materials. The flow sensor measured substantial groundwater flow directed vertically downward into the salt dome. The data obtained with the flow sensor provided critical evidence which was instrumental in assessing the significance of the sinkhole in terms of the integrity of the oil storage facility.

239 (SAND-95-0344C) Comparison of lower-frequency (<1000 Hz) downhole seismic sources for use at environmental sites. Elbring, G.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950450-3: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL (United States), 23-27 Apr 1995). Order Number DE95008547. Source: OSTI; NTIS; INIS; GPO Dep.

In conjunction with crosswell seismic surveying being done at the Hanford Site in south-central Washington, four different downhole seismic sources have been tested between the same set of boreholes. The four sources evaluated were the Bolt airgun, the OYO-Conoco orbital vibrator, and two Sandia-developed vertical vibrators, one pneumatically-driven, and the other based on a magnetostrictive actuator. The sources generate seismic energy in the lower frequency range of less than 1000 Hz and have different frequency characteristics, radiation patterns, energy levels, and operational considerations. Collection of identical data sets with all four sources allows the direct comparison of these characteristics and an evaluation of the suitability of each source for a given site and target.

240 (SAND-95-0574C) Offsite demonstrations for MWLID technologies. Williams, C. (Sandia National Labs., Albuquerque, NM (United States)); Gruebel, R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504135-1: 5. annual waste-management education and research consortium (WERC) technology development conference, Las Cruces,

NM (United States), 18-20 Apr 1995). Order Number DE95009585. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of the Offsite Demonstration Project for Mixed Waste Landfill Integrated Demonstration (MWLID)-developed environmental site characterization and remediation technologies is to facilitate the transfer, use, and commercialization of these technologies to the public and private sector. To meet this goal, the project identified environmental restoration needs of mixed waste and/or hazardous waste landfill owners (Native American, municipal, DOE, and DoD); documenting potential demonstration sites and the contaminants present at each site; assessing the environmental regulations that would effect demonstration activities; and evaluating site suitability for demonstrating MWLID technologies at the tribal and municipal sites identified. Eighteen landfill sites within a 40.2-km radius of Sandia National Laboratories are listed on the CERCLIS Site/Event Listing for the state of New Mexico. Seventeen are not located within DOE or DoD facilities and are potential offsite MWLID technology demonstration sites. Two of the seventeen CERCLIS sites, one on Native American land and one on municipal land, were evaluated and identified as potential candidates for off-site demonstrations of MWLID-developed technologies. Contaminants potentially present on site include chromium waste, household/commercial hazardous waste, volatile organic compounds, and petroleum products. MWLID characterization technologies applicable to these sites include Magnetometer Towed Array, Cross-borehole Electromagnetic Imaging, SitePlanner™/PLUME, Hybrid Directional Drilling, Seamist™/Vadose Zone Monitoring, Stripping Analyses, and x-ray Fluorescence Spectroscopy for Heavy Metals.

241 (UCRL-CR-118921) MODLP program description: A program for solving linear optimal hydraulic control of groundwater contamination based on MODFLOW simulation. Version 1.0. Ahlfeld, D.P. (Connecticut Univ., Storrs, CT (United States). Dept. of Civil Engineering); Dougherty, D.E. Lawrence Livermore National Lab., CA (United States); Vermont Univ., Burlington, VT (United States). Research Center for Groundwater Remediation Design. Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95005912. Source: OSTI; NTIS; INIS; GPO Dep.

MODLP is a computational tool that may help design capture zones for controlling the movement of contaminated groundwater. It creates and solves linear optimization programs that contain constraints on hydraulic head or head differences in a groundwater system. The groundwater domain is represented by USGS MODFLOW groundwater flow simulation model. This document describes the general structure of the computer program, MODLP, the types of constraints that may be imposed, detailed input instructions, interpretation of the output, and the interaction with the MODFLOW simulation kernel.

242 (UCRL-ID-115645) Tracing ground water movement in the Eastern Livermore Valley, Alameda County, California, using stable isotopes, major ion chemistry, and a line source model. Rees, G.R. IV. Lawrence Livermore National Lab., CA (United States). Aug 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94017295. Source: OSTI; NTIS; GPO Dep.

Water from the Sierra Nevada Mountains was released into an arroyo in the Eastern Livermore Valley. Most of this imported water is believed to have recharged the ground

water near Lawrence Livermore National Laboratory (LLNL). The movement of ground water was monitored by the use of isotopic analyses. Chemically distinct water types were discovered. A computer ground water model, which uses line sources to simulate recharge from the watershed indicates the direction and velocity of water flows. This model, when used to simulate artificial recharge, indicates the recharge could have changed the ground water flow direction near LLNL in a direction supported by the distribution of isotopically light ground water under LLNL.

243 (UCRL-JC-115345) Dynamic Underground Stripping: In situ steam sweeping and electrical heating to remediate a deep hydrocarbon spill. Yow, J.L. Jr.; Aines, R.D.; Newmark, R.L.; Udell, K.S.; Ziagos, J.P. Lawrence Livermore National Lab., CA (United States). Jul 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950225-1: Geoenvironment 2000 meeting, Baton Rouge, LA (United States), 22-24 Feb 1995). Order Number DE94016595. Source: OSTI; NTIS; GPO Dep.

Dynamic Underground Stripping is a combination of in situ steam injection, electrical resistance heating, and fluid extraction for rapid removal and recovery of subsurface contaminants such as solvents or fuels. Underground imaging and other measurement techniques monitor the system in situ for process control. Field tests at a deep gasoline spill at Lawrence Livermore National Laboratory recovered over 7000 gallons of gasoline during several months of field operations. Preliminary analysis of system cost and performance indicate that Dynamic Underground Stripping compares favorably with conventional pump-and-treat and vacuum extraction schemes for removing non-aqueous phase liquids such as gasoline from deep subsurface plumes.

244 (UCRL-JC-116436) Groundwater flux, travel time, and radionuclide transport. Chesnut, D.A. Lawrence Livermore National Lab., CA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941075-4: 18. international symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE95002401. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Livermore National Laboratory (LLNL) provides the scientific and engineering bases for design and performance analyses of the waste package and other components of the engineered barrier system (EBS) for a potential repository at Yucca Mountain, Nevada. The EBS is an important component of a multi-barrier system designed to isolate radioactive waste until it decays to the point that it is no longer radiologically hazardous to humans or other species. Its performance depends strongly upon the amount, chemical composition, and temperature of liquid water in the "near field" region immediately surrounding the waste packages. For this reason, much of LLNL's Yucca Mountain research has been directed toward understanding flow, transport, and chemical processes in fractured rock under both preemplacement and post-emplacement conditions. Because the radioactive decay heat from a potential repository at Yucca Mountain would dominate the movement of water for thousands of years within the entire repository block and possibly even beyond, the spatial domain of our investigations ranges from the scale of individual fracture apertures (micrometers) to a few kilometers.

245 (UCRL-JC-116572) **3D imaging of chemical transport in porous media.** Rashidi, M. (Lawrence Livermore National Lab., CA (United States). Measurement Science); Milanovich, F.P. Lawrence Livermore National Lab., CA (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940853-4: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94016455. Source: OSTI; NTIS; GPO Dep.

In recent years, investigation of chemical transport in porous media has drawn considerable attention in many fields due to its potential applications in environmental problems, chemical and petroleum related processes, and microbiological systems. Chemical transport porous media has been studied using a novel non-intrusive fluorescence imaging technique. The test section consists of a porous column packed with spherical beads and a refractive index-matched fluid seeded with tracer particles or a dye for velocity and concentration measurements, respectively. The system is automated to image through the porous medium for collecting local values of velocity and concentration at a good accuracy and a high resolution. A complete flow experiment was carried out in which a dye front was injected into the porous system and its dispersion was tracked. Microscopic velocity and concentration fields were obtained in a full three-dimensional volume of the test section.

246 (UCRL-JC-117678) **Innovative technologies for in-situ remediation.** Ragaini, R.; Aines, R.; Knapp, R.; Matthews, S.; Yow, J. Lawrence Livermore National Lab., CA (United States). Jun 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9210194-12: International symposium on environmental contamination in Central and Eastern Europe, Budapest (Hungary), 12-16 Oct 1992). Order Number DE94017174. Source: OSTI; NTIS; INIS; GPO Dep.

LLNL is developing several innovative remediation technologies as long-term improvements to the current pump and treat approaches to cleaning up contaminated soils and groundwater. These technologies include dynamic underground stripping, in-situ microbial filters, and remediation using bremsstrahlung radiation. Concentrated underground organic contaminant plumes are one of the most prevalent groundwater contamination sources. The solvent or fuel can percolate deep into the earth, often into water-bearing regions. Collecting as a separate, liquid organic phase called dense non-aqueous-phase liquids (DNAPLs), or light NAPLs (LNAPLs), these contaminants provide a source term that continuously compromises surrounding groundwater. This type of spill is one of the most difficult environmental problems to remediate. Attempts to remove such material requires a huge amount of water which must be washed through the system to clean it, requiring decades. Traditional pump and treat approaches have not been successful. LLNL has developed several innovative technologies to clean up NAPL contamination. Detailed descriptions of these technologies are given.

247 (WHC-EP-0394-8) **Groundwater maps of the Hanford Site, December 1993.** Kasza, G.L.; Hartman, M.J.; Jordan, W.A.; Borghese, J.V. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019056. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an update to the series of reports that document the configuration of the uppermost unconfined aquifer beneath the Hanford Site. This series presents the latest results of the semiannual water level measurement program and the water table maps generated from these measurements. The reports document the changes in the groundwater level at the Hanford Site during the transition from nuclear material production to environmental restoration and remediation. In addition, these reports provide water level data to support the various site characterization and groundwater monitoring programs currently in progress on the Hanford Site. The three major operations areas (the 100, 200 and 300/1100 Areas) where wastes were discharged to the soil are covered in this update. The water level measurements from the wells in these areas are portrayed on a set of maps to illustrate the hydrologic conditions and are also tabulated in an appendix. A summary discussion of the data is included with the well index map, the depth to water map, and the contoured map of the water table surface for each of the three areas.

248 (WHC-EP-0394-9) **Groundwater maps of the Hanford Site, June 1994.** Serkowski, J.A.; Jordan, W.A.; Hartman, M.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006798. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a continuation of reports (Kasza et al., 1994) that document the configuration of the uppermost unconfined aquifer beneath the Hanford Site. This series presents the results of the semiannual water level measurement program and the water table maps generated from these measurements. The reports document the changes in the groundwater level at the Hanford Site during the transition from nuclear material production to environmental restoration and remediation. In addition, these reports provide water level data to support the various site characterization and groundwater monitoring programs currently in progress on the Hanford Site. This report highlights the three major operations areas (the 100, 200, and 300/1100 Areas) where wastes were discharged to the soil. Each area includes a summary discussion of the data, a well index map, and a contoured map of the water table surface.

249 (WHC-EP-0694) **Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils.** Thornton, E.C. (Westinghouse Hanford Co., Richland, WA (United States)); Baechler, M.A.; Beck, M.A.; Amonette, J.E. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001554. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-scale soil treatment tests were conducted as part of an effort to develop and implement an in situ chemical treatment approach to the remediation of metal and radionuclide contaminated soils through the use of reactive gases. In general, > 90% immobilization of chromium and > 50% immobilization of uranium was achieved. Leach test results indicate that the treatment process is irreversible for chromium but partially reversible for uranium indicates that immobilization for this contaminant is more readily achieved in organic rich soils. This observation is ascribed to the reducing nature of organic matter. Additional tests were also conducted with soils contaminated to the 5,000 ppm level

with nitrate. Nitrate was not found to interfere significantly with treatment of the contaminants. Nitrite was observed in the leachate samples obtained from tests with an organic-rich soil containing clay, however. Leachate chemistries suggested that no other significantly hazardous byproducts were generated by the treatment process and that soil alteration effects were minimal. Test results also suggest that treatment effectiveness is somewhat lower in very dry soils but still able to immobilize chromium and uranium to an acceptable degree. Results of these testing activities indicate that the concentration of hydrogen sulfide in the gas mixture is not a limited factor in treatment as long as a sufficient volume of the mixture is delivered to the soil to achieve a mole ratio of hydrogen sulfide to contaminant of at least 10.

250 (WHC-EP-0730) The influence of small mammal burrowing activity on water storage at the Hanford Site. Landeen, D.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000733. Source: OSTI; NTIS; INIS; GPO Dep.

The amount and rate at which water may penetrate a protective barrier and come into contact with buried radioactive waste is a major concern. Because burrowing animals eventually will reside on the surface of any protective barrier, the effect these burrow systems may have on the loss or retention of water needs to be determined. The first section of this document summarizes the known literature relative to small mammals and the effects that burrowing activities have on water distribution, infiltration, and the overall impact of burrows on the ecosystem. Topics that are summarized include burrow air pressures, airflow, burrow humidity, microtopography, mounding, infiltration, climate, soil evaporation, and discussions of large pores relative to water distribution. The second section of this document provides the results of the study that was conducted at the Hanford Site to determine what effect small mammal burrows have on water storage. This Biointrusion task is identified in the Permanent Isolation Surface Barrier Development Plan in support of protective barriers. This particular animal intrusion task is one part of the overall animal intrusion task identified in Animal Intrusion Test Plan.

251 (WHC-EP-0769-Rev.1) Task E container corrosion studies: Annual report: Revision 1. Bunnell, L.R. (Pacific Northwest Lab., Richland, WA (United States)); Doremus, L.A.; Topping, J.B.; Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94017997. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory is conducting the Solid Waste Technology Support Program (SWTSP) for Westinghouse Hanford Company (WHC). Task E is the Container Corrosion Study Portion of the SWTSP that will perform testing to provide defensible data on the corrosion of low-carbon steel, as used in drums to contain chemical and radioactive wastes at the Hanford Site. A second objective of Task E is to provide and test practical alternative materials that have higher corrosion resistance than low-carbon steel. The scope of work for fiscal year (FY) 1993 included initial testing of mild steel specimens buried in Hanford soils or exposed to atmospheric corrosion in metal storage sheds. During FY 1993, progress was made in three areas of Task E. First, exposure of test materials began at the Soil Corrosion Test Site where low-carbon steel specimens were

placed in the soil in five test shafts at depths of 9 m (30 ft). Second, the corrosion measurement of low-carbon steel in the soil of two solid waste trenches continued. The total exposure time is $\approx$ 500 days. Third, an atmospheric corrosion test of low-carbon steel was initiated in a metal shed (Building 2401-W) in the 200 West Area. This annual report describes the Task E efforts and provides a current status.

252 (WHC-EP-0777) VOC-Arid Integrated Demonstration guide to preparation of demonstration documents. Jensen, E.J.; Brouns, T.M.; Koegler, K.J.; McCabe, G.H.; Morris, F.A. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014115. Source: OSTI; NTIS; INIS; GPO Dep.

This guide has been prepared by Demonstration Operations of the Volatile Organic Compound-Arid Integrated Demonstration (VOC-Arid ID). Its purpose is to describe demonstration documents, designate responsibilities for these documents, and guide the Principal Investigator (PI) and others in their preparation. The main emphasis of this guide is to describe the documentation required of the PI. However, it does cover some of the responsibilities of other members of the VOC-Arid ID team. The VOC-Arid ID is one of several US Department of Energy (DOE) integrated demonstrations designed to support the demonstration of emerging environmental management and restoration technologies. The principal objective of the VOC-Arid ID is to identify, develop, and demonstrate new and innovative technologies for environmental restoration at arid or semiarid sites containing volatile organic compounds with or without associated contamination (e.g., radionuclides and metals).

253 (WHC-EP-0797) Cone penetrometer testing at the Hanford Site: Final performance evaluation report. Richterich, L.R.; Cassem, B.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002469. Source: OSTI; NTIS; INIS; GPO Dep.

The Volatile Organic Compounds-Arid Integrated Demonstration (VOC-Arid ID) is one of several US Department of Energy (DOE) integrated demonstrations designed to support the testing of emerging environmental characterization and remediation technologies in support of the Environmental Restoration (ER) and Waste Management (WM) Programs. The primary objective of the VOC Arid ID at the Hanford Site is to characterize, remediate, and monitor arid and semi-arid sites containing volatile organic compounds with or without associated contamination. The main objective of the Arid Drilling Technology Technical Task Plan is to demonstrate promising subsurface access technologies; this includes using the cone penetrometer (CPT) system for source detection, characterization, monitoring, and remediation in support of environmental activities. The utility of the CPT for performing site characterization work has been the subject of much discussion and speculation at the Hanford Site and other arid sites because of the preponderance of thick units of coarse cobbles and gravel in the subsurface.

254 (WHC-EP-0813) Ground water impact assessment report for the 216-B-3 Pond system. Johnson, V.G.; Law, A.G.; Reidel, S.P.; Evelo, S.D.; Barnett, D.B.; Sweeney, M.D. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 94p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005055. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water impact assessments were required for a number of liquid effluent receiving sites according to the Hanford Federal Facility Agreement and Consent Order Milestones M-17-00A and M-17-00B, as agreed upon by the US Department of Energy. This report is one of the last three assessments required and addresses the impact of continued discharge of uncontaminated wastewater to the 216-B-3C expansion lobe of the B Pond system in the 200 East Area until June 1997. Evaluation of past and projected effluent volumes and composition, geohydrology of the receiving site, and contaminant plume distribution patterns, combined with ground water modeling, were used to assess both changes in ground water flow regime and contaminant-related impacts.

255 (WHC-EP-0835) State of work for services provided by the Waste Sampling and Characterization Facility for effluent monitoring. Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007184. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the services the Waste Sampling and Characterization Facility (WSCF) shall provide Effluent Monitoring (EM) throughout the calendar year for analysis. The internal memo contained in Appendix A identifies the samples Em plans to submit for analysis in CY-1995. Analysis of effluent (liquid and air discharges) and environmental (air, liquid, animal, and vegetative) samples is required using standard laboratory procedures, in accordance with regulatory and control requirements. This report describes regulatory reporting requirements and WSCF services and data quality objectives.

256 (WHC-SA-1937) Combining Innovative technology demonstrations with dense nonaqueous phase liquids cleanup. Hagood, M.C. (Westinghouse Hanford Co., Richland, WA (United States)); Koegler, K.J.; Rohay, V.J.; Trent, S.J.; Stein, S.L.; Brouns, T.M.; McCabe, G.H.; Tomich, S. Westinghouse Hanford Co., Richland, WA (United States). May 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930906-21: '93 international conference on nuclear waste management and environmental remediation, Prague (Czech Republic), 5-11 Sep 1993). Order Number DE95001642. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactively contaminated acidic aqueous wastes and organic liquids were discharged to the soil column at three disposal sites within the 200 West Area of the Hanford Site, Washington. As a result, a portion of the underlying groundwater is contaminated with carbon tetrachloride several orders of magnitude above the maximum contaminant level accepted for a drinking water supply. Treatability testing and cleanup actions have been initiated to remove the contamination from both the unsaturated soils to minimize further groundwater contamination and the groundwater itself. To expedite cleanup, innovative technologies for (1) drilling, (2) site characterization, (3) monitoring, (4) well field development, and (5) contaminant treatment are being demonstrated and subsequently used where possible to improve the rates and cost savings associated with the removal of carbon tetrachloride from the soils and groundwater.

257 (WHC-SA-1950) Electrochemical characterization of grouted radioactive waste. Gu, J. (Brooklyn Coll., NY (United States)); Zhu, Z.; Tomkiewicz, M. Westinghouse Hanford Co., Richland, WA (United States). Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931195-5: International symposium on scientific basis for nuclear waste management, Boston, MA (United States), 29 Nov - 3 Dec 1993). Order Number DE95000458. Source: OSTI; NTIS; INIS; GPO Dep.

Any long-term disposal system of radioactive waste will require monitoring to warn against structural deterioration and leach of the radioactive or hazardous components into the environment. Although the existing methods, based on physical sampling and testing, provide a higher level of confidence in the data, it also results in generation of secondary waste streams and increased exposure to radiation for workers. Therefore, it is highly desirable that a method be developed for remotely sensing the grout. Efforts are focused on the application of an array of long lasting electrodes that will sense the dynamic properties of ions in the grout. The basic unit structure consists of four electrodes through which the authors perform a variety of measurements such as impedance, single frequency conductivity, electrochemical potential, cyclic voltammetry, etc. Grout and other cementitious materials are described within the general context of composite media in which morphology, chemistry and conductivity are interdependent. They describe experimental results that include time evolution over many months of the impedance and electrochemical potential of hydrating (and drying) cement composite and their attempts at interpreting these data in terms of conductivity and dielectric constant of the matrix. Along with the time evolution tests; they have performed the resistivity measurement during simulated deionized water flooding into the dry grout. The leach test experiment is designed to establish possible correlation with present quality verification methods and standard leach test or other such accepted tests.

258 (WHC-SA-2268) Field screening for hexavalent chromium in soil: A fast-turnaround field method based on water extraction. McCain, R.G.; Baechler, M.A. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9403130-1: 5. annual West Coast conference on contaminated soils and groundwater, Long Beach, CA (United States), 28 Mar - 1 Apr 1994). Order Number DE94013231. Source: OSTI; NTIS; INIS; GPO Dep.

Sodium dichromate has been identified as a contaminant of concern at several waste sites on the Hanford Site. Although chromium standards for soil are typically stated in terms of total chrome, much of the toxicity and carcinogenicity are attributed to the hexavalent state, which typically exists as a relatively mobile anion. Investigation and removal of crushed drums potentially containing residual sodium dichromate required a field test for hexavalent chromium to support characterization and remediation activities. Previous experience with a commercially available field test kit had been unsuccessful. This stimulated an effort to determine potential sources of error in the field test and led to a number of modifications that significantly improved the reliability of the test.

259 (WHC-SA-2358) Some statistical aspects of background based groundwater standards at an arid hazardous waste site. Chou, C.J.; Hodges, F.N.; Johnson,

V.G. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940748-9: 35. annual meeting of the Institute of Nuclear Materials Management (INMM), Naples, FL (United States), 17-20 Jul 1994). Order Number DE94015669. Source: OSTI; NTIS; INIS; GPO Dep.

Statistical goodness-of-fit tests and "Box and Whisker" plots of hydrochemical data from selected contaminant-free downgradient wells, and wells located upgradient in a non-contaminated or background area show that spatially distinct sample populations do not exhibit significant differences in groundwater chemical composition within the upper unconfined aquifer. Well location dominates natural constituent variability at this arid site. Spatial coverage should be emphasized in such cases rather than sampling frequency. 5 refs., 3 figs., 1 tab.

260 (WHC-SA-2377) The development of surface barriers at the Hanford Site. Wing, N.R. (Westinghouse Hanford Co., Richland, WA (United States)); Gee, G.W. (Westinghouse Hanford Co., Richland, WA (United States)). Mar 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941124-7: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94015753. Source: OSTI; NTIS; INIS; GPO Dep.

Engineered barriers are being developed to isolate wastes disposed of near the earth's surface at the US Department of Energy's (DOE) Hanford Site near Richland, Washington. Much of the waste that would be disposed of by in-place stabilization currently is located in relatively shallow subsurface structures such as solid waste burial grounds, tanks, vaults, and cribs. Unless protected in some way, the wastes could be transported to the accessible environment via the following pathways: plant, animal, and human intrusion; water infiltration; erosion; and the exhalation of noxious gases. Permanent isolation surface barriers have been proposed to protect wastes disposed of "in place" from the transport pathways identified previously (Figure 1). The protective barrier consists of a variety of different materials (e.g., fine soil, sand, gravel, riprap, asphalt, etc.) placed in layers to form an above-grade mound directly over the waste zone. Surface markers are being considered for placement around the periphery of the waste sites to inform future generations of the nature and hazards of the buried wastes. In addition, throughout the protective barrier, subsurface markers could be placed to warn any inadvertent human intruders of the dangers of the buried wastes (Figure 2).

261 (WHC-SA-2481) Stabilization void-fill encapsulation high-efficiency particulate filters. Alexander, R.G.; Stewart, W.E.; Phillips, S.J.; Serkowski, M.M.; England, J.L.; Boynton, H.C. (Westinghouse Hanford Co., Richland, WA (United States)). May 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-25: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013228. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses high-efficiency particulate air (HEPA) filter systems that which are contaminated with radionuclides are part of the nuclear fuel processing systems conducted by the US Department of Energy (DOE) and require replacement and safe and efficient disposal for plant

safety. Two K-3 HEPA filters were removed from service, placed burial boxes, buried, and safely and efficiently stabilized remotely which reduced radiation exposure to personnel and the environment.

262 (WHC-SA-2640) Hanford 200 area (sanitary) waste water system. Danch, D.A.; Gay, A.E. (Westinghouse Hanford Co., Richland, WA (United States)). Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9409213-1: Pacific NW Pollution Control Association conference, Spokane, WA (United States), 18-21 Sep 1994). Order Number DE95000336. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Hanford Site is located in southeastern Washington State. The Hanford Site is approximately 1,450 sq. km (560 sq. mi) of semiarid land set aside for activities of the DOE. The reactor fuel processing and waste management facilities are located in the 200 Areas. Over the last 50 years at Hanford dicard of hazardous and sanitary waste water has resulted in billions of liters of waste water discharged to the ground. As part of the TPA, discharges of hazardous waste water to the ground and waters of Washington State are to be eliminated in 1995. Currently sanitary waste water from the 200 Area Plateau is handled with on-site septic tank and subsurface disposal systems, many of which were constructed in the 1940s and most do not meet current standards. Features unique to the proposed new sanitary waste water handling systems include: (1) cost effective operation of the treatment system as evaporative lagoons with state-of-the-art liner systems, and (2) routing collection lines to avoid historic contamination zones. The paper focuses on the challenges met in planning and designing the collection system.

263 (WHC-SA-2755) Testing of a benchscale Reverse Osmosis/Coupled Transport system for treating contaminated groundwater. Hodgson, K.M.; Lunsford, T.R.; Panjabi, G. (Westinghouse Hanford Co., Richland, WA (United States)). Jan 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950646-2: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95005984. Source: OSTI; NTIS; INIS; GPO Dep.

The Reverse Osmosis/Coupled Transport process is a innovative means of removing radionuclides from contaminated groundwater at the Hanford Site. Specifically, groundwater in the 200 West Area of the Hanford Site has been contaminated with uranium, technetium, and nitrate. Investigations are proceeding to determine the most cost effective method to remove these contaminants. The process described in this paper combines three different membrane technologies (reverse osmosis, coupled transport, and nanofiltration to purify the groundwater while extracting and concentrating uranium, technetium, and nitrate into separate solutions. This separation allows for the future use of the radionuclides, if needed, and reduces the amount of waste that will need to be disposed of. This process has the potential to concentrate the contaminants into solutions with volumes in a ratio of 1/10,000 of the feed volume. This compares to traditional volume reductions of 10 to 100 for ion exchange and stand-alone reverse osmosis. The successful demonstration of this technology could result in significant savings in the overall cost of decontaminating the groundwater.

264 (WHC-SA-2810) Laboratory evaluation of the potential for in situ treatment of chromate-contaminated

groundwater by chemical precipitation. Thornton, E.C.; Beck, M.A.; Jurgensmeier, C.A. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950646-11: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95009091. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper is to present the results of a series of small-scale batch tests performed to assess the effectiveness of chemical precipitation in the remediation of chromate-contaminated groundwater. These tests involved treatment of chromate solutions with ferrous and sulfide ions. In addition, tests were conducted that involved treatment of mixtures of chromate-contaminated groundwater and uncontaminated soil with the ferrous ion. A combination of ferrous sulfate and sodium sulfide was also tested in the groundwater treatment tests, since this approach has been shown to be an efficient method for treating electroplating wastewaters.

265 (WHC-SD-534-CSWD-006-Rev.1) Continuous control databases for the 242A MCS. Berger, J.F. Westinghouse Hanford Co., Richland, WA (United States). 22 Feb 1995. 337p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010093. Source: OSTI; NTIS; INIS; GPO Dep.

A Distributive Process Control system was purchased by Project B-534. This computer-based control system, called the Monitor and Control System (MCS), was installed in the 242-A Evaporator located in the 200 East Area. The purpose of the MCS is to monitor and control the Evaporator and monitor a number of alarms and other signals from various Tank Farm facilities. Applications software for the MCS was developed by the Waste Treatment System Engineering group of Westinghouse. This document describes the Continuous Control Database for the MCS system.

266 (WHC-SD-534-CSWL-001-Rev.2) Sequence and batch language programs and alarm-related "C" programs for the 242-A MCS. Revision 2. Berger, J.F. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 700p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008814. Source: OSTI; NTIS; INIS; GPO Dep.

A Distributive Process Control system was purchased by Project B-534, "242-A Evaporator/Crystallizer Upgrades". This control system, called the Monitor and Control System (MCS), was installed in the 242-A Evaporator located in the 200 East Area. The purpose of the MCS is to monitor and control the Evaporator and monitor a number of alarms and other signals from various Tank Farm facilities. Applications software for the MCS was developed by the Waste Treatment Systems Engineering (WTSE) group of Westinghouse. The standard displays and alarm scheme provide for control and monitoring, but do not directly indicate the signal location or depict the overall process. To do this, WTSE developed a second alarm scheme which uses special programs, annunciator keys, and process graphics. The special programs are written in two languages; Sequence and Batch Language (SABL), and "C" language. The WTSE-developed alarm scheme works as described below: SABL relates signals and alarms to the annunciator keys, called SKID keys. When an alarm occurs, a SABL program causes a SKID key to flash, and if the alarm is of yellow or white priority then a "C" program turns on an audible horn (the D/3 system uses

a different audible horn for the red priority alarms). The horn and flashing key draws the attention of the operator.

267 (WHC-SD-C018-RPT-003) 1994 Characterization report for the state approved land disposal site. Swanson, L.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001036. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of characterization activities at the proposed state-approved land disposal site (SALDS); it updates the original characterization report with studies completed since the first characterization report. The initial characterization report discusses studies from two characterization boreholes, 699-48-77A and 699-48-77B. This revision includes data from implementation of the Groundwater Monitoring Plan and the Aquifer Test Plan. The primary sources of data are two down-gradient groundwater monitoring wells, 699-48-77C and 699-48-77D, and aquifer testing of three zones in well 699-48-77C. The SALDS is located on the Hanford Site, approximately 183 m north of the 200 West Area on the north side of the 200 Areas Plateau. The SALDS is an infiltration basin proposed for disposal of treated effluents from the 200 Areas of Hanford.

268 (WHC-SD-EN-AP-151-Rev.1) Description of work for 200-UP-1 characterization of monitoring wells: Revision 1. Innis, B.E.; Kely, G.G. Westinghouse Hanford Co., Richland, WA (United States). 31 Mar 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94012932. Source: OSTI; NTIS; INIS; GPO Dep.

This description of work details the field activities associated with the drilling, soil sampling, and construction of groundwater monitoring and dual-use wells as part of the Remedial Investigation/Feasibility Study Work Plan for the 200-UP-1 Groundwater Operable Unit and will serve as a field guide for those performing the work. It will be used in conjunction with DOE-RE and Environmental Investigations and Site Characterization Manual. Groundwater wells are being constructed to characterize the vertical and horizontal extent of the Uranium and ⁹⁹Tc plumes and to define aquifer properties such as hydraulic communication between aquifers and hydrostratigraphy. Some of these wells may be utilized for extraction purposes during the Interim Remedial Measures (IRM) phase anticipated at this operable unit and are being designed with a dual use in mind. These data will be used to optimize the IRM for the cleanup of these two plumes. The data will also be used with later Limited Field Investigation data to perform a Qualitative Risk Assessment for the operable unit. The locations for the proposed groundwater wells are presented. The contaminants of concern for the project are presented also.

269 (WHC-SD-EN-AP-165) Interim-status groundwater monitoring plan for the 216-B-63 trench. Sweeney, M.D. Westinghouse Hanford Co., Richland, WA (United States). 9 Feb 1995. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007786. Source: OSTI; NTIS; GPO Dep.

This document outlines the groundwater monitoring plan, under RCRA regulations in 40 CFR 265 Subpart F and WAC173-300-400, for the 216-B-63 Trench. This interim status facility is being sampled under detection monitoring

criteria and this plan provides current program conditions and requirements.

270 (WHC-SD-EN-AP-179) **Underground storage tanks 200W-FS-34 and 200W-FS-35 excavated soil field sample plan.** Lucas, J.G. Westinghouse Hanford Co., Richland, WA (United States). 7 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000433. Source: OSTI; NTIS; INIS; GPO Dep.

This plan outlines the process that will be used to collect samples from soil excavated during removal of underground storage tanks 200W-FS-34 and 200W-FS-35. The samples will be analyzed to determine if gasoline and diesel fuel are present in the soil at levels above action levels specified by the Washington State Department of Ecology. On April 15, 1992, the underground storage tanks were removed and soil samples were collected at each former tank location and from around the associated piping. Soil was excavated from the site until field instrumentation indicated that the former tank sites were clean in the judgment of the field team leader. Field monitoring consisted of using an organic vapor monitor to survey soil shaken in a plastic bag. Monitoring indicated that petroleum contamination ranged from 40 to 800 ppm.

271 (WHC-SD-EN-AP-181) **Instructions for borehole sampling.** Reynolds, K.D.; Lindsey, K.A. Westinghouse Hanford Co., Richland, WA (United States). 11 Nov 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003857. Source: OSTI; NTIS; INIS; GPO Dep.

Geologic systems generally are complex with physical properties and trends that can be difficult to predict. Subsurface geology exerts a fundamental control on groundwater flow and contaminant transport. The primary source for direct observation of subsurface geologic information is a borehole. However, direct observations from a borehole essentially are limited to the diameter and spacing of boreholes and the quality of the information derived from the drilling. Because it is impractical to drill a borehole every few feet to obtain data, it is necessary to maximize the data gathered during limited drilling operations. A technically defensible balance between the customer's data quality objectives and control of drilling costs through limited drilling can be achieved with proper conduct of operations. This report presents the minimum criteria for geologic and hydrologic characterization and sampling that must be met during drilling. It outlines the sampling goals that need to be addressed when drilling boreholes, and the types of drilling techniques that work best to achieve these goals under the geologic conditions found at Hanford. This report provides general guidelines for: (1) how sampling methods are controlled by data needs, (2) how minimum sampling requirements change as knowledge and needs change, and (3) when drilling and sampling parameters need to be closely controlled with respect to the specific data needs. Consequently, the report is divided into two sections that center on: (1) a discussion of basic categories of subsurface characterization, sampling, and sampling techniques, and (2) guidelines for determining which drilling and sampling techniques meet required characterization and sampling objectives.

272 (WHC-SD-EN-AP-184) **Hanford Wells Integrity Inspection Plan for the ROM Program.** Dorsey, M.C. Westinghouse Hanford Co., Richland, WA (United States). 4

Apr 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010089. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document specifies the technical requirements, schedule, and process for conducting well integrity inspections and rehabilitation on resource protection wells under the custodianship of the RCRA and Operational Monitoring program.

273 (WHC-SD-EN-DP-071-Rev.1) **Hanford well custodians. Revision 1.** Schatz, A.L.; Underwood, D.J. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 582p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008451. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Groundwater Protection Management Program recognized the need to integrate monitoring well activities in a centralized manner. A key factor to Hanford Site well integration was the need to clearly identify a responsible party for each of the wells. WHC was asked to identify all wells on site, the program(s) using each well, and the program ultimately responsible for the well. This report lists the custodian and user(s) for each Hanford well and supplies a comprehensive list of all decommissioned and orphaned wells on the Hanford Site. This is the first update to the original report released in December 1993.

274 (WHC-SD-EN-DP-082) **Borehole completion data package for well 199-N-81.** Hartman, M.J. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94012933. Source: OSTI; NTIS; INIS; GPO Dep.

Well 199-N-81 was drilled in 1993 as a RCRA groundwater monitoring for the 1324-N network. The well is completed at the top of the uppermost aquifer, in the Ringold Formation. This data package includes information on drilling, construction, development, and aquifer testing. Copies of forms, notes, and diagrams completed in the field comprise the bulk of this document. Few interpretations are included. Lithologic contacts were picked by the site geologist. An attempt was made to interpret aquifer test data.

275 (WHC-SD-EN-DP-089) **Aquifer testing data package for 1993 200-UP-1 Groundwater Operable Unit.** Swanson, L.C. Westinghouse Hanford Co., Richland, WA (United States). 24 Jun 1994. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015337. Source: OSTI; NTIS; INIS; GPO Dep.

The following aquifer testing data supported 1993 Interim Remedial Measure field work for the U-1 and U-2 crib area near the uranium technetium and nitrate plumes beneath the U Plant Aggregate Area. The purpose of aquifer testing was to fill in hydraulic conductivity data gaps in the western portion of 200 West Area and help refine the hydrogeologic conceptual model. This data package reports data collected in accordance with the description of work released in 1993 by L.C. Swanson, entitled Description of Work for the 200-UP-1 Aquifer Testing Activity. These data are analyzed in the document Aquifer Test Analysis Results for 1993 200-UP-1 Groundwater Operable Unit. Slug tests were conducted at 7 existing wells, and pumping tests were conducted at 2 of those same existing wells.

276 (WHC-SD-EN-DP-090) **Borehole data package for the 100-K area ground water wells, CY 1994.** Williams, B.A. Westinghouse Hanford Co., Richland, WA

(United States). 27 Dec 1994. 523p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005628. Source: OSTI; NTIS; INIS; GPO Dep.

Borehole, hydrogeologic and geophysical logs, drilling, as-built diagrams, sampling, and well construction information and data for RCRA compliant groundwater monitoring wells installed in CY 1994 at the 100-K Basins.

277 (WHC-SD-EN-EE-014) Hanford site comprehensive site compliance evaluation report. Burris, S.A.; Menard, N.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010074. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the first annual submittal by Westinghouse Hanford Company (WHC) and contains the results of inspections of the storm water outfalls listed in the Hanford Site Storm Water Pollution Prevention Plan (SWPPP) (WHC 1993a) as required by General Permit No. WA-R-00-000F (WA-R-00-A17F). This report also describes the methods used to conduct the Comprehensive Site Compliance Evaluation (CSCE), as required in Part IV, Section D. 4. c of the General Permit, summarizes the results of the compliance evaluation, and documents significant leaks and spills.

278 (WHC-SD-EN-PMP-008) Project management plan, N Springs expedited response action. Jackson, G.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Jun 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015331. Source: OSTI; NTIS; INIS; GPO Dep.

In accordance with the past-practice strategy, the US Department of Energy (DOE) is conducting an expedited response action (ERA) at the N Springs, located in the Hanford 100 N Area. This Project Management Plan (PMP) addresses the design and construction of a sheet pile barrier and the design, construction, and operation of an ion-exchanged pump and treat system at N Springs. There were three objectives set for the N Springs ERA, which are outlined in Item 6 in the Senior Executive Agreement Committee Agreement on the Resolution of Milestone M-14-00 Change Request Dispute. The first N Springs ERA objective is to eliminate or substantially reduce the flux of strontium-90 to the N Springs, and ultimately to the Columbia River via groundwater migration. A sheet pile barrier will be installed in the path of groundwater flow, forcing strontium-90 contaminated groundwater to flow around it in order to reach the river, substantially decreasing groundwater flow velocity. Since the strontium transport velocity is approximately 2 orders of magnitude less than that of the groundwater in the vicinity, the flux of strontium-90 to the river will be reduced. The second N Springs ERA objective is to evaluate commercially available treatment options for strontium-90 contaminated groundwater. The third N Spring ERA objective is to provide data necessary to set appropriate strontium-90 contaminated groundwater cleanup standards.

279 (WHC-SD-EN-PRS-002) Summary report of Hanford Site well remediation and decommissioning activities for fiscal year 1994. Reynolds, K.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005629. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation and decommissioning of Hanford Site wells has become an integral part of Hanford Site Environmental Restoration (ER) and Resource Conservation and Recovery Act of 1976 (RCRA) groundwater monitoring programs. A well remediation and decommissioning program was funded and implemented in fiscal year (FY) 1993 under the RCRA and Operational Monitoring (ROM) Program. Funding for this work increased in FY 1994. In FY 1994 well decommissioning activities conducted for the ROM program were centered around the 200 West Area; activities for the ER program were centered in the Fitzner/Eberhart Arid Land Ecology (ALE) (Reserve) unit and the Wahluke Slope (North Slope) area. A total of 116 wells and test borings were decommissioned between the two programs during FY 1994. Additionally, five wells were identified as in need of remediation and were successfully brought into compliance with regulatory requirements. As Hanford Site restoration and remediation efforts increase in scope, the well decommissioning program will remain dynamic. The program will aggressively seek to fulfill the needs of the various environmental cleanup and groundwater/vadose monitoring programs. Wells that do not meet regulatory requirements for preservation will continually be identified and remediated or decommissioned accordingly.

280 (WHC-SD-EN-RA-007) Qualitative risk assessment for the 100-HR-3 groundwater operable unit. Vukelich, S.E. (Golder Associates, Inc., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Golder Associates, Inc., Richland, WA (United States). 22 Sep 1994. 173p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005405. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the qualitative risk assessment for the 100-HR-3 operable unit on the Hanford Reservation. 100-HR-3 is a ground water unit. The purpose of the QRA at the 100-HR-3 operable unit is to focus on a predefined set of human and environmental exposure scenarios in order to provide sufficient information that will assist the Tri-Party signatories (Washington State Department of Ecology, EPA and US DOE) in making defensible decisions on the necessity of Interim Remedial Measures. Frequent- and occasional-use exposure scenarios are evaluated in the human health risk assessment to provide bounding estimates of risk. The ecological risk assessment consists of an evaluation of the risks to riparian and aquatic receptors which live in or near the Columbia River.

281 (WHC-SD-EN-RA-010) Qualitative risk assessment for the 100-KR-4 groundwater operable unit. Biggerstaff, R.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015671. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the qualitative risk assessment (QRA) for the 100-KR-4 groundwater operable unit at the US Department of Energy's (DOE) Hanford Site in southeastern Washington State. The extent of the groundwater beneath the 100 K Area is defined in the Remedial Investigation/Feasibility Study Work Plan for the 100-KR-4 Operable Unit (DOE-RL 1992a). The QRA is an evaluation or risk using a limited amount of data and a predefined set of human and environmental exposure scenarios and is not intended to replace or be a substitute for a baseline risk assessment.

282 (WHC-SD-EN-TI-204) Ground-penetrating radar investigations conducted in the 100 areas, Hanford Site: Fiscal Year 1992. Bergstrom, K.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000988. Source: OSTI; NTIS; INIS; GPO Dep.

During Fiscal Year 1992, the Geophysics Group conducted forty-five Ground-Penetrating Radar (GPR) surveys in the 100 Areas (Figure 1) - Objectives for the investigations varied, from locating cribs, trenches and septic systems to helping site boreholes. The results of each investigation were delivered to clients in the form of a map that summarized the interpretation of a given site. No formal reports were prepared. The purpose of this document is to show where and why each of the surveys was conducted. The data and interpretation of each survey are available by contacting the Westinghouse Hanford Company, Geophysics Group. A map showing the location and basic parameters of each survey can be found in the Appendices of this report.

283 (WHC-SD-EN-TI-211) Data validation report for the 100-FR-3 Operable Unit, third round groundwater samples. Ayres, J.M. Westinghouse Hanford Co., Richland, WA (United States). 31 Mar 1994. 226p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94010368. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse-Hanford has requested that a minimum of 20% of the total number of Sample Delivery Groups be validated for the 100-FR-3 operable Unit Third Round Groundwater sampling investigation. Therefore, the data from the chemical analysis of 51 samples from this sampling event and their related quality assurance samples were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site. The report is broken down into sections for each chemical analysis and radiochemical analysis type. Each section addresses the data package completeness, holding time adherence, instrument calibration and tuning acceptability, blank results, accuracy, precision, system performance, as well as the compound identification and quantitation. In addition, each section has an overall assessment and summary for the data packages reviewed for the particular chemical/radiochemical analyses. Detailed backup information is provided to the reader by SDG No. and sample number. For each data package, a matrix of chemical analyses per sample number is presented, as well as data qualification summaries.

284 (WHC-SD-EN-TI-229) Geophysical survey for proposed borehole 199-K-107A, 100-K Area. Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004370. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the survey was to locate subsurface obstructions that may affect the drilling of proposed borehole, 199-K-107A, located about 100 ft northwest of the 105 KW Building, 100-K Area. Based upon the results of the survey, possible drill sites within the zone, with the least likelihood of encountering identified obstructions, were identified. The ground-penetrating radar (GPR) system used for this work utilized a 300-megahertz antenna to transmit the electromagnetic (EM) energy into the ground. The transmitted energy is reflected back to a receiving antenna where variations in the return signal are recorded. Common reflectors

include natural geologic conditions such as bedding, cementation, moisture, and clay, or man-made objects such as pipes, barrels, foundations, and buried wires. Several isolated anomalies, at various depths, are observed in the data. Additionally, two areas that appear disturbed, with perplexing character, are plotted. Because of the uncertain nature of these two areas, they were avoided when recommending a borehole location. Initially, the proposed borehole was staked at N130/E122. The new proposed borehole location is N139/E176. This location appears free of anomalies and is over 10 ft from interpreted linear anomalies/pipe-like features.

285 (WHC-SD-EN-TI-230) Geophysical survey for proposed borehole 199-K-106A, 100-K Area. Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). 8 Jul 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015741. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the survey was to locate subsurface obstructions that may affect the drilling of proposed borehole, 199-K-106A, about 50 ft east of the 1,714 KW Building, 100-K Area. Based upon the results of the survey, possible drill sites within the zone, with the least likelihood of encountering identified obstructions, were identified. The ground-penetrating radar (GPR) system used for this work utilized a 300-megahertz antenna to transmit the electromagnetic (EM) energy into the ground. The transmitted energy is reflected back to a receiving antenna where variations in the return signal are recorded. Common reflectors include natural geologic conditions such as bedding, cementation, moisture, and clay, or man-made objects such as pipes, barrels, foundations, and buried wires. The method is limited in depth by transmit power, receiver sensitivity, frequency, and attenuation of the transmitted energy which can be strongly affected by geology. Depth of investigation is also influenced by highly conductive material, such as metal drums, which reflect all the energy back to the receiver. Therefore, the method cannot "see" below such objects. Maximum depth of penetration for this survey seemed to be about 10 to 12 ft.

286 (WHC-SD-EN-TI-248) 1994 conceptual model of the carbon tetrachloride contamination in the 200 West Area at the Hanford Site. Rohay, V.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 275p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015756. Source: OSTI; NTIS; INIS; GPO Dep.

Between 1955 and 1973, a total of 363,000 to 580,000 L (577,000 to kg) of liquid carbon tetrachloride, in mixtures with other organic and aqueous, actinide-bearing fluids, were discharged to the soil column at three disposal facilities - the 216-Z-9 Trench, the 216-Z-1A Tite Field, and the 216-Z-18 Crib - in the 200 West Area at the Hanford Site. In the mid-1980's, dissolved carbon tetrachloride was found in the uppermost aquifer beneath the disposal facilities, and in late 1990, the US Environmental Protection Agency and the Washington State Department of Ecology requested that the US Department of Energy proceed with planning and implementation of an expedited response action (ERA) to minimize additional carbon tetrachloride contamination of the groundwater. In February 1992, soil vapor extraction was initiated to remove carbon tetrachloride from the unsaturated zone beneath these disposal facilities. By May 1994, a total of 10,560 L (16,790 kg) of carbon tetrachloride had been removed, amounting to an estimated 2% of the

discharged inventory. In the spring of 1991, the Volatile Organic Compounds - Arid Integrated Demonstration (VOC-Arid ID) program selected the carbon tetrachloride-contaminated site for demonstration and deployment of new technologies for evaluation and cleanup of volatile organic compounds and associated contaminants in soils and groundwater at arid sites. Site investigations conducted in support of both the ERA and the VOC-Arid ID have been integrated because of their shared objective to refine the conceptual model of the site and to promote efficiency. Site characterization data collected in fiscal year 1993 have supported and led to refinement of the conceptual model of the carbon tetrachloride site.

287 (WHC-SD-EN-TI-253) Geophysical survey for proposed boreholes, 199-K-109A, 199-K-110A, and 199-K-111A, 100K Area. Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005099. Source: OSTI; NTIS; INIS; GPO Dep.

A survey was conducted to locate subsurface obstructions that may affect the drilling of three proposed boreholes in the 100K Area. Drill sites with the least likelihood of encountering obstructions were identified by the method of ground-penetrating radar. These results are presented in this document.

288 (WHC-SD-EN-TI-263) Geophysical investigation for proposed flow meter installation holes, 100H Area. Kiesler, J.P. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005465. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of the surveys were to locate subsurface obstructions that may affect the drilling of two holes to be fit with flow meters in the 100-H Area of the Hanford Site (Figure 1). Possible drill sites with the least likelihood of encountering identified obstructions were identified based upon the results of the survey. Ground-penetrating radar (GPR) was the method selected for the investigations. The electromagnetic induction method was also used to verify that the general site is relatively void of metallic debris at depth.

289 (WHC-SD-EN-TI-266) Data validation report for the 100-KR-4 operable unit first quarter, 1994. Krug, A.D. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015329. Source: OSTI; NTIS; INIS; GPO Dep.

Samples were obtained from the 100-KR-4 Operable Unit first Quarter 1994 Groundwater Sampling event. The data from the chemical analysis of fifty-eight samples from this sampling event and their related quality assurance samples were reviewed and validated to verify that reported samples results were of sufficient quality to support decisions regarding remedial actions performed at this site. Information from the sampling event and the information validation processes are presented in this document.

290 (WHC-SD-EN-TI-267) Data validation report for the 100-HR-3 Operable Unit first quarter 1994 groundwater sampling data. Biggerstaff, R.L. Westinghouse Hanford Co., Richland, WA (United States). 24 Jun 1994. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015645. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse-Hanford has requested that a minimum of 20% of the total number of Sample Delivery Groups be validated for the 100-HR-3 Operable Unit First Quarter 1994 Groundwater Sampling Investigation. Therefore, the data from the chemical analysis of twenty-four samples from this sampling event and their related quality assurance samples were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site. The samples were analyzed by Thermo-Analytic Laboratories (TMA) and Roy F. Weston Laboratories (WESTON) using US Environmental Protection Agency (EPA) CLP protocols. Sample analyses included: inorganics; and general chemical parameters. Forty-two samples were validated for radiochemical parameters by TMA and Teledyne.

291 (WHC-SD-EN-TI-271) Radionuclide logging of Tank 216-T-106, borehole 299-W10-196. Price, R.K. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003862. Source: OSTI; NTIS; INIS; GPO Dep.

Geophysical surveys were conducted in borehole 299-W10-196 during construction to profile the radionuclide contaminants in the vadose zone that leaked from single-shell Tank 216-T-106. Contaminants from the tank leak were detected to 120 feet below the ground surface. A second complete geophysical survey was conducted about one year after drilling was completed to evaluate contaminant movement that may have been caused by the presence of the cased borehole. Contaminant movement would warrant plugging and abandoning the borehole. Comparison of the two surveys indicate that no contamination movement to greater depths can be identified.

292 (WHC-SD-EN-TI-280) Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994. Peterson, R.E. Westinghouse Hanford Co., Richland, WA (United States). 29 Aug 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018470. Source: OSTI; NTIS; INIS; GPO Dep.

Fuel storage basins associated with the 105-KE and 105-KW reactor buildings are currently being used to store irradiated fuel rods from past operations. Each reactor building contains a basin that holds approximately 1.3 million gal of water. The water provides a radiation shield, as well as a thermal sink for heat generated by the stored fuel. Some of the fuel rods stored in the K-East basin have damaged cladding and are stored in open canisters, allowing contact between the metallic uranium fuel and basin water. The interaction results in radionuclides being released to the basin water. Various exchange columns and filters associated with a closed-circuit circulation system are in place to reduce radionuclide concentrations in basin water. Tritium cannot be removed by these methods and is present in K-East basin water at a concentration of several million pCi/L. In contrast, K-West basin, where only fully encapsulated, undamaged fuel is stored, exhibits tritium concentrations at much lower levels—several hundred thousand pCi/L. The water budget for the basins includes water losses resulting from evaporation and possibly leakage, and the addition of make-up water to maintain a specific level. Water loss calculations are based on water level decreases during time intervals when no make-up water is added. A calculated loss rate beyond what is expected due to evaporation and uncertainty in the calculations, is assumed to be leakage to the soil

column. Given sufficiently high leakage rates, and/or a preferential pathway for downward migration through the soil column, basin water may contaminate groundwater flowing beneath the basins.

293 (WHC-SD-EN-TI-281) Geophysical Investigation of the 216-B-3-1 ditch, Operable Unit 200-BP-11, 200 East Area. Bergstrom, K.A. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000430. Source: OSTI; NTIS; INIS; GPO Dep.

Ditch 216-B-3-1 is located within the 200-BP-11 Operable Unit, located immediately northeast of the 200 East Area. At one time, it drained into B Pond. The ditch has been filled with soil and the surrounding area reclaimed. There is no remaining physical evidence showing the original location of the ditch. Survey stakes were recently emplaced that show the documented location of the ditch from survey coordinates. The objective of this investigation was to verify the staked location of the ditch with non-intrusive geophysical methods. Ground-penetrating radar (GPR) and electromagnetic induction (EMI) were the methods selected for the investigation. GPR has been used successfully to locate similar ditches in other parts of the Hanford Reservation. EMI was used because it is much quicker to collect and interpret, and if successful, could be used to rapidly map the entire length of the ditch. Results are discussed.

294 (WHC-SD-EN-TP-032) Integrated test plan for demonstration of a prompt fission neutron logging tool. Koegler, K.J. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010673. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the demonstration of the geophysical logging tool as part of the Volatile Organic Compounds Arid Sites Integrated Demonstration (VOC-Arid ID) and the Buried Waste Integrated Demonstration. Purpose is to show that the tool can log cased boreholes at Hanford waste sites for the presence in the soil of fissionable isotopes.

295 (WHC-SD-EN-TP-043) Laboratory test plan in-well vapor stripping system. Koegler, K.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014408. Source: OSTI; NTIS; GPO Dep.

This test plan describes the activities that will be conducted as a part of the laboratory testing of a full-scale mockup of the Stanford in-well vapor stripping system. These tests will be conducted to delineate design parameters for the in-well vapor stripping unit and to identify and quantify variables that are sensitive to the dynamic hydraulic effects induced by operation of the system. No radioactive materials are involved in this test. In-well vapor stripping has been used successfully as an alternative to conventional pump-and-treat technology for remediation of volatile organic compound (VOC) contaminated groundwater in Europe and more recently in the United States. In-well vapor stripping permits in situ remediation of VOC-contaminated groundwater by combining an in-well vapor stripping system with a treatment well is used to extract and discharge groundwater simultaneously, resulting in the establishment of a vertical circulation groundwater flow cell in the aquifer. Groundwater extracted from the aquifer via the lower screened interval is

treated for VOCs by in-well vapor stripping within the treatment well. This stripping causes aqueous phase VOCs to partition preferentially into a vapor phase. Treated groundwater is discharged back to the aquifer via the upper screened interval of the treatment well, while the vapor phase VOCs are simultaneously removed from the well bore and contained at the surface with a vacuum extraction system. Groundwater entrained into the vertical circulation flow cell becomes sequentially cleaned of VOC contamination in an efficient manner without the need for surface treatment and handling of contaminated groundwater. An added benefit of in-well vapor stripping is the ability to perform vadose zone vapor extraction concurrently with groundwater remediation. This uses the vacuum extraction capabilities of the in-well vapor stripping configured with the upper screened interval placed into the vadose zone above the water table.

296 (WHC-SD-EN-TP-044) Integrated test plan for preliminary demonstration of the in situ permeable flow sensor in the unsaturated sediments at the Hanford Site. Rohay, V.J. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014119. Source: OSTI; NTIS; INIS; GPO Dep.

This integrated test plan describes the demonstration of the in situ permeable flow sensor, developed by Sandia National Laboratory, to measure air flow in unsaturated sediments. The ability of this technology to measure groundwater flow velocity in saturated sediments has already been successfully demonstrated. This preliminary test of this device in the unsaturated zone will be considered successful if in fact the flowmeters are able to detect a gas flow velocity. The field demonstration described in this integrated test plan is being conducted as part of the Volatile Organic Compounds-Arid Integrated Demonstration (VOC-Arid ID). The VOC-Arid ID is one of several US Department of Energy (DOE) integrated demonstrations designed to support the testing of emerging environmental management and restoration technologies. The purpose of the VOC-Arid ID is to identify, develop, and demonstrate technologies that may be used to characterize, remediate, and/or monitor arid or semi-arid sites containing VOCs (e.g., carbon tetrachloride) with or without associated metal and radionuclide contamination. Initially, the VOC-Arid ID activities are focusing primarily on the carbon tetrachloride and associated contamination found in the 200 West Area of the Hanford Site. Testing of the in situ permeable flow sensor will be conducted at the location of the proposed Environmental Restoration Disposal Facility (ERDF). The data regarding subsurface air flow rates and pathways collected during the flow sensor testing will be used in the ongoing characterization of the proposed ERDF.

297 (WHC-SD-EN-TP-047-Rev.1) Integrated test plan ResonantSonic drilling system technology demonstration-1995, at the Hanford Site: Revision 1. McLellan, G.W. Westinghouse Hanford Co., Richland, WA (United States). 17 Nov 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004148. Source: OSTI; NTIS; INIS; GPO Dep.

This integrated test plan describes the demonstration test of the ResonantSonic drilling system. This demonstration is part of the Office of Technology Development's Volatile Organic Compound Arid Integrated Demonstration (VOC-Arid ID). Two main purposes of this demonstration are (1) to continue testing the ResonantSonic drilling system compatibility

with the Hanford Site waste characterization programs, and (2) to transfer this method for use at the Hanford Site, other government sites, and the private sector. The ResonantSonic method is a dry drilling technique. Field testing of this method began in July 1993. During the next four months, nine holes were drilled, and continuous core samples were retrieved. Penetration rates were 2 to 3 times the baseline, and the operational downtime rate was less than 10%. Successfully demonstrated equipment refinements included a prototype 300 series ResonantSonic head, a new drill rod design for 18-centimeter diameter pipe, and an automated pipe handling system. Various configurations of sampling equipment and drill bits were tested, depending on geologic conditions. The principal objective of the VOC-Arid ID is to determine the viability of emerging technologies that can be used to characterize, remediate, and/or monitor arid or semiarid sites containing VOCs (e.g., carbon tetrachloride) with or without associated metal and radionuclide contamination.

298 (WHC-SD-EN-TP-051) Technology transition to demonstration plan - in situ remediation by the gas treatment approach. Thornton, E.C. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010036. Source: OSTI; NTIS; INIS; GPO Dep.

This Technology Transition to Demonstration Plan has been prepared to define the documentation required to support the demonstration of an in situ approach to soil treatment. This approach consists of the injection of a gas mixture into waste site soils for the purpose of immobilizing selected inorganic contaminant constituents. Development of this technology has been conducted by WHC under support provided by the DOE In Situ Remediation Integrated Program. A demonstration of this technology will take place in the 60's pits of the Chemical Waste Landfill located at Sandia National Laboratories (SNL) in Albuquerque, New Mexico. The demonstration will be hosted by the DOE Mixed Waste Landfill Integrated Demonstration and will involve joint participation of WHC and SNL staff. Documentation supporting this effort will include pre-demonstration and post-demonstration documents that follow a prescribed format. This report consists primarily of the pre-demonstration documents, but also identifies post-demonstration documents that will be prepared. A draft Demonstration Plan is also included that will undergo expansion and revision as input is obtained from the several organizations involved in the field demonstration.

299 (WHC-SD-EN-TRP-007) Phase I ResonantSonic CRADA report. Richterich, L.R. (Westinghouse Hanford Co., Richland, WA (United States)); Amos, L.O.; Fancher, J.D.; McLellan, G.W.; Setzer, W.V.; Tuttle, B.G.; Hockey, R.L.; Ferris, R.H.; Riechers, D.M.; Pitman, S.G. Westinghouse Hanford Co., Richland, WA (United States); Pacific Northwest Lab., Richland, WA (United States). 28 Mar 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE95001463. Source: OSTI; NTIS; INIS; GPO Dep.

This test report describes the Phase 1 testing and results of the ResonantSonic drilling method. This effort was conducted as part of a Cooperative Research and Development Agreement (CRADA) between the US Department of Energy, Pacific Northwest Laboratory, Westinghouse Hanford Company and Water Development Corporation. The purpose

of this demonstration was to evaluate the Water Development Corporation's ResonantSonic drilling system, modify components as necessary and determine compatible drilling applications for the ResonantSonic drilling method for use at facilities in the DOE complex and private industry. Initially, the ResonantSonic drill was used to drill several test holes at the Drilling Technology Test Site to assess the feasibility of drilling vertical and angle holes. After this initial phase, a 45 degree angle vapor extraction well was drilled to a depth of 168 feet at the 200 West Carbon Tetrachloride Site. This well was drilled and completed in nine days. Extensive geologic and vapor sampling were conducted while drilling this well. In addition, testing was also conducted at the test site to evaluate drilling with larger diameter casing (8 5/8 inch). Evaluation of the Resonant Sonic drilling method will be continued during the Phase 2 portion of testing to determine if improvements to the ResonantSonic system will make it a more viable method for drilling and sampling.

300 (WHC-SD-EN-WP-012) Groundwater monitoring plan: 200 Areas treated effluent disposal facility (Project W-049H). Barnett, D.B.; Davis, J.D.; Collard, L.B.; Freeman, P.B.; Chou, C.J. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 230p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010111. Source: OSTI; NTIS; INIS; GPO Dep.

This groundwater monitoring plan provides information that supports the US Department of Energy's application (DOE-RL 1994) for waste water discharge permit No. WA-ST-4502 from the State of Washington, under the auspices of Washington Administrative Code 173-216. The monitoring plan has two functions: (1) to summarize the results of a 3-yr characterization of the current hydrogeology and groundwater quality of the discharge site and (2) to provide plans for evaluating the effects of the facility's operation on groundwater quality and document compliance with applicable groundwater quality standards. Three wells were drilled to define the stratigraphy, evaluate sediment characteristics, and establish a groundwater monitoring net work for the discharge facility. These wells monitor groundwater quality upgradient and downgradient in the uppermost aquifer. This report proposes plans for continuing the monitoring of groundwater quality and aquifer characteristics after waste water discharges begin.

301 (WHC-SD-ER-CSWD-004) VAM3D-CG configuration management plan. Langford, D.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000437. Source: OSTI; NTIS; INIS; GPO Dep.

The VAM3D-CG computer code has been licensed for use at Hanford, from HydroGeologic, Inc., of Herndon, VA. Version 2.4b has been installed on the 3200GWW workstations, and is currently under configuration management. The purpose of this report is to describe the installation and configuration management of VAM3D-CG on the Hanford Computer System. VAM3D-CG is written in standard FORTRAN F77.

302 (WHC-SD-ETF-PCP-001) Control system troubleshooting guide for the 300 area treated effluent disposal facility. McCarthy, R.J.; Whitehurst, R.; Knox, J.M.; Hultgren, H.M.; Bleazard, K. Westinghouse Hanford Co., Richland, WA (United States). 8 Aug 1994. 246p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95010061. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting Document is intended to be used to help locate problems with the 300 Area Treated Effluent Disposal Facility (TEDF) computer Control System.

303 (WHC-SD-ETF-PLN-002) Transition plan: Project C-018H, 200-E Area Effluent Treatment Facility. Connor, M.D. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001539. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this transition plan is to ensure an orderly transfer of project information to operations to satisfy Westinghouse Hanford Company (WHC) operational requirements and objectives, and ensure safe and efficient operation of Project C-018H, the 200-E Area Effluent Treatment Facility (ETF). This plan identifies the deliverables for Project C-018H upon completion of construction and turnover to WHC for operations, and includes acceptance criteria to objectively assess the adequacy of the contract deliverables in relation to present requirements. The scope of this plan includes a general discussion of the need for complete and accurate design basis documentation and design documents as project deliverables. This plan also proposes that a configuration management plan be prepared to protect and control the transferred design documents and reconstitute the design basis and design requirements, in the event that the deliverables and project documentation received from the contractor are less than adequate at turnover.

304 (WHC-SD-ETF-TA-001) Documentation assessment, Project C-018H, 200-E area effluent treatment facility. Peres, M.W.; Connor, M.D.; Mertelendy, J.I. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005641. Source: OSTI; NTIS; INIS; GPO Dep.

Project C-018H is one of the fourteen subprojects to the Hanford Environmental Compliance (HEC) Project. Project C-018H provides treatment and disposal for the 242-A Evaporator and PUREX plant process condensate waste streams. This project used the Integrated Management Team (IMT) approach proposed by RL. The IMT approach included all affected organizations on the project team to coordinate and execute all required project tasks, while striving to integrate and satisfy all technical, operational, functional, and organizational objectives. The HEC Projects were initiated in 1989. Project C-018H began in early 1990, with completion of construction currently targeted for mid-1995. This assessment was performed to evaluate the effectiveness of the management control on design documents and quality assurance records developed and submitted for processing, use, and retention for the Project. The assessment focused primarily on the overall adequacy and quality of the design documentation currently being submitted to the project document control function.

305 (WHC-SD-SNF-ATP-004) K West basin isolation barrier leak rate test. Whitehurst, R.; McCracken, K.; Papenfuss, J.N. Westinghouse Hanford Co., Richland, WA (United States). 31 Oct 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005678. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the procedure for performing the acceptance test on the two isolation barriers being installed in K West basin. This acceptance test procedure shall be used to: First establish a basin water loss rate prior to installation of the two isolation barriers between the main basin and the discharge chute in K-Basin West. Second, perform an acceptance test to verify an acceptable leakage rate through the barrier seals.

306 (WHC-SD-SNF-ATP-005) 105-KE Isolation Barrier leak rate acceptance test procedure WHC-SD-SNF-ATP-005. Whitehurst, R.; McCracken, K.; Papenfuss, J.N. Westinghouse Hanford Co., Richland, WA (United States). 31 Oct 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003077. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the procedure for performing the acceptance test on the two isolation barriers being installed in K East basin. This acceptance test procedure shall be used to: First establish a basin water loss rate prior to installation of the two isolation barriers between the main basin and the discharge chute in K-Basin East. Second, perform an acceptance test to verify an acceptable leakage rate through the barrier seals. This Acceptance Test Procedure (ATP) has been prepared in accordance with CM-6-1 EP 4.2, Standard Engineering Practices.

307 (WHC-SD-SNF-ER-005) Testing of Isolation barrier sealing surfaces. Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005432. Source: OSTI; NTIS; INIS; GPO Dep.

Isolation barrier doors are to be installed in the 105KE and 105KW basins as part of the 1994 unreviewed safety question (USQ) resolution plan to isolate the fuel storage basin from the fuel discharge chute. Included in this installation is the placement of new sealing surfaces for the barriers by affixing stainless steel plates to existing carbon steel angle bars with a specially formulated epoxy adhesive/sealant material. The sealant is a two-part component consisting of an epoxy resin (the condensation product of bisphenol A and epichlorohydrin) and a curing agent (a proprietary cycloaliphatic polyamine). The sealant is solvent free (complying with air pollution regulations) and capable of withstanding the surrounding radiation fields over an estimated 15-year service life. The epoxy sealant experiences negligible water damage partly because of its hydrophobic (water-repelling) nature. With bond tensile strengths measured at greater than 862 kPa (125 lbf/in²), the epoxy sealant is judged acceptable for its intended application. The four-hour pot life of the epoxy sealant provides sufficient time to apply the epoxy, examine the epoxy bead for continuity, and position the stainless steel sealing plates.

308 (WHC-SD-SNF-ER-006) 105-KE Basin Isolation barrier leak rate test analytical development. Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005223. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides analytical developments in support of the proposed leak rate test of the 105-KE Basin. The analytical basis upon which the K-basin leak test results will be used to determine the basin leakage rates is developed in

this report. The leakage of the K-Basin isolation barriers under accident conditions will be determined from the test results. There are two fundamental flow regimes that may exist in the postulated K-Basin leakage, viscous laminar and turbulent flow. An analytical development is presented for each flow regime. The basic geometry and nomenclature of the postulated leak paths are denoted.

309 (WHC-SD-SNF-ES-001) KE Basin water dispositioning engineering study. Hunacek, G.S.; Gahir, S.S. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001035. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering study is a feasibility study of KE Basin water treatment to an acceptable level and dispositioning the treated water to Columbia River, ground through ETF or to air through evaporation.

310 (WHC-SD-SNF-ES-002) Engineering study: 105KE to 105KW Basin fuel and sludge transfer. Final report. Gant, R.G. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Columbia Energy and Environmental Services, Inc., Richland, WA (United States). 20 Sep 1994. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001033. Source: OSTI; NTIS; INIS; GPO Dep.

In the last five years, there have been three periods at the 105KE fuel storage basin (KE Basin) where the reported drawdown test rates were in excess of 25 gph. Drawdown rates in excess of this amount have been used during past operations as the primary indicators of leaks in the basin. The latest leak occurred in March, 1993. The reported water loss from the KE Basin was estimated at 25 gph. This engineering study was performed to identify and recommend the most feasible and practical method of transferring canisters of irradiated fuel and basin sludge from the KE Basin to the 105KW fuel storage basin (KW Basin). Six alternatives were identified during the performance of this study as possible methods for transferring the fuel and sludge from the KE Basin to the KW Basin. These methods were then assessed with regard to operations, safety, radiation exposure, packaging, environmental concerns, waste management, cost, and schedule; and the most feasible and practical methods of transfer were identified. The methods examined in detail in this study were based on shipment without cooling water except where noted: Transfer by rail using the previously used transfer system and water cooling; Transfer by rail using the previously used transfer system (without water cooling); Transfer by truck using the K Area fuel transfer cask (K Area cask); Transfer by truck using a DOE shipping cask; Transfer by truck using a commercial shipping cask; and Transfer by truck using a new fuel shipping cask.

311 (WHC-SD-SNF-TI-006) Summary status of K Basins sludge characterization. Baker, R.B. Westinghouse Hanford Co., Richland, WA (United States). 20 Jan 1995. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006651. Source: OSTI; NTIS; INIS; GPO Dep.

A number of activities are underway as part of the Spent Nuclear Fuels Project (SNFP) related to the processing and disposing of sludge in the 105-K Basins (K Basins). Efforts to rigorously define data requirements for these activities are being made using the Data Quality Objectives (DQO) process. Summaries of current sludge characterization data

are required to both help support this DQO process and to allow continued progress with on-going engineering activities (e.g., evaluations of disposal alternatives). This document provides the status of K Basins sludge characterization data currently available to the Nuclear Fuel Evaluations group. This group is tasked by the SNFP to help develop and maintain the characterization baseline for the K Basins. The specific objectives of this document are to: (1) provide a current summary (and set of references) of sludge characterization data for use by SNFP initiatives, to avoid unnecessary duplication of effort and to support on-going initiatives; (2) submit these data to an open forum for review and comment, and identify additional sources of significant data that may be available; (3) provide a summary of current data to use as part of the basis to develop requirements for additional sludge characterization data through the DQO process; (4) provide an overview of the intended activities that will be used to develop and maintain the sludge characterization baseline.

312 (WHC-SD-W049-ATR-001) Project W-049H disposal facility test report. Buckles, D.I. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005440. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Acceptance Test Report (ATR) for the Project W-049H, Treated Effluent Disposal Facility, is to verify that the equipment installed in the Disposal Facility has been installed in accordance with the design documents and function as required by the project criteria.

313 (WHC-SD-W049H-ATP-001) Acceptance test procedure for Project W-049H. Buckles, D.I. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 29 Sep 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001516. Source: OSTI; NTIS; INIS; GPO Dep.

The Acceptance Test Procedure (ATP) program for Project W-049H (200 Area Treated Effluent Disposal Facility [TEDF]) covers three activities as follows: (1) Disposal System; (2) Collection System; and (3) Instrumentation and Control System. Each activity has its own ATP. The purpose of the ATPs is to reverify that the systems have been constructed in accordance with the construction documents and to demonstrate that the systems function as required by the Project criteria. The Disposal System ATP covers the testing of the following: disposal line flowmeters, room air temperatures in the Disposal Station Sampling Building, effluent valves and position indicators, disposal pond level monitors, automated sampler, pressure relief valves, and overflow diversion sluice gates. The Collection System ATP covers the testing of the two pump stations and all equipment installed therein. The Instrumentation and Control (I and C) ATP covers the testing of the entire TEDF I and C system. This includes 3 OCS units, modem, and GPII cabinets in the ETC control room; 2 pump stations; disposal station sampling building; and all LCUs installed in the field.

314 (WHC-SD-W049H-ATP-002) Project W-049H collection system Acceptance Test Procedure. Carrigan, M.C. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 11 Nov 1994. 85p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003764. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Acceptance Test Procedure (ATP) for the Project W-049H, Treated Effluent Disposal Facility, is to verify that the collection system equipment installed as Pump Station No. 1 (225-W) and Pump Station No. 2 (225-E) have been installed in accordance with the design documents and function as required by the project criteria. This will be a wet test with potable water being introduced into the pump pits to test for leakage. Potable water will also be employed in the testing of the pumps and related mechanical equipment. All Instrument and Control equipment related to the pump stations will be checked electronically with simulated inputs/outputs when actual input/output signals are unavailable. Water from Pump Station 1 will be moved through the TEDF piping system and discharged into the disposal ponds. This will check the proper function of the air/vac valves not tested during construction, and the automated samplers.

315 (WHC-SD-W049H-ATP-003) Project W-049H instrument and control Acceptance Test Procedure. Carigan, M.C. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003763. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Acceptance Test Procedure (ATP) for the Project W-049H, Treated Effluent Disposal Facility, is to verify that the instrument and control systems have been installed in accordance with the design documents and function as required by the project criteria. The instrument and control system includes three operator control stations, modems, and general purpose LAN interface cabinets in the Effluent Treatment Facility control room; two pump stations; disposal station pumping building; and all local control units installed in the fold. Testing will be performed using actual signals when available and simulated signals when actual signals are unavailable.

316 (WHC-SD-W049H-ATR-002) Project W-049H Collection System Acceptance Test. Buckles, D.I. Westinghouse Hanford Co., Richland, WA (United States). 11 Nov 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005683. Source: OSTI; NTIS; INIS; GPO Dep.

The Acceptance Test Procedure (ATP) Program for Project W-049H covers the following activities: Disposal system, Collection system, Instrumentation and control system. Each activity has its own ATP. The purpose of the ATPs is to verify that the systems have been constructed in accordance with the construction documents and to demonstrate that the systems function as required by the Project criteria. This ATP has been prepared to demonstrate that the Collection System Instrumentation functions as required by project criteria.

317 (WHC-SD-W049H-ATR-003) Project W-049H instrument & control acceptance test report. Johnston, G.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005080. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report documents the completed Acceptance Test Procedure WHC-SD-W049H-ATP-003.

318 (WHC-SD-W049H-CSRS-001) Treated effluent disposal system process control computer software requirements and specification. Graf, F.A. Jr. Westinghouse Hanford Co., Richland, WA (United States). 3 Jun 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004470. Source: OSTI; NTIS; INIS; GPO Dep.

The software requirements for the monitor and control system that will be associated with the effluent collection pipeline system known as the 200 Area Treated Effluent Disposal System is covered. The control logic for the two pump stations and specific requirements for the graphic displays are detailed.

319 (WHC-SD-W049H-ICD-001-Rev.1) 200 Area TEDF interface control document. Brown, M.J.; Hildebrand, R.A. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004472. Source: OSTI; NTIS; INIS; GPO Dep.

Because the TEDF does not have any treatment or retention capacity, strict control at the generator interface is essential to operate the TEDF in compliance with good engineering practices, Hanford site requirements, and the 216 Discharge Permit. The information in the Interface Control Document (ICD) forms the basis of understanding between all parties involved in the TEDF; DOE, WHC, and the generating facilities. The ICD defines the controlling document hierarchy; LEF, and generator responsibilities; monitoring and sampling requirements; and specifies the TEDF/Generator Interface points.

320 (WHC-SD-W049H-RRR-001) Readiness Assessment Plan, Hanford 200 areas treated effluent disposal facilities. Ulmer, F.J. Westinghouse Hanford Co., Richland, WA (United States). 6 Feb 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007193. Source: OSTI; NTIS; INIS; GPO Dep.

This Readiness Assessment Plan documents Liquid Effluent Facilities review process used to establish the scope of review, documentation requirements, performance assessment, and plant readiness to begin operation of the Treated Effluent Disposal system in accordance with DOE-RLID-5480.31, Startup and Restart of Facilities Operational Readiness Review and Readiness Assessments.

321 (WHC-SD-W105-OTR-003) Operational test report for LERF Basin 242AL-44 integrity test. Galioto, T.M. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003851. Source: OSTI; NTIS; INIS; GPO Dep.

This operational test report documents the results of LERF operational testing per operational test procedure (OTP) TFPE-WP-0231, "LERF Basin Integrity Testing." The primary purpose of the OTP was to resolve test exceptions generated as a result of TFPE-WP-0184. The TOP was prepared and performed in accordance with WHC-SD-534-OTP-002, "Operational Test Plan for the 242-A Evaporator Upgrades and the Liquid Effluent Retention Facility." WHC-S-086, "Specification for Operational Testing of the Liquid Effluent Retention Facility, Basin Integrity Testing," identified the test requirements and acceptance criteria. The completed, signed-off test procedure is contained in Appendix A. The test log is contained in Appendix B. Section 2.1 describes all

the test exceptions written during performance of the Operational Test Procedure. The test revisions generated during the testing are discussed in Section 2.2. The dispositioned test exception forms are contained in Appendix C.

322 (WHC-SD-W252-ACDR-001) Advanced conceptual design report. Phase II. Liquid effluent treatment and disposal Project W-252. Corps of Engineers, Walla Walla, WA (United States). Engineering Div. 31 Jan 1995. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006876. Source: OSTI; NTIS; INIS; GPO Dep.

This Advanced Conceptual Design Report (ACDR) provides a documented review and analysis of the Conceptual Design Report (CDR), WHC-SD-W252-CDR-001, June 30, 1993. The ACDR provides further design evaluation of the major design approaches and uncertainties identified in the original CDR. The ACDR will provide a firmer basis for the both the design approach and the associated planning for the performance of the Definitive Design phase of the project.

323 (WHC-SD-W252-FDC-001-Rev.1) Functional design criteria for Project W-252, Phase II Liquid Effluent Treatment and Disposal: Revision 1. Hatch, C.E. Westinghouse Hanford Co., Richland, WA (United States). 10 Nov 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003838. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the functional design criteria required for the Phase 2 Liquid Effluent Treatment and Disposal Project, Project W-252. Project W-252 shall provide new facilities and existing facility modifications required to implement Best Available Technology/All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment (BAT/AKART) for the 200 East Phase II Liquid Effluent Streams. The project will also provide a 200 East Area Phase II Effluent Collection System (PTECS) for connection to a disposal system for relevant effluent streams to which BAT/AKART has been applied. Liquid wastestreams generated in the 200 East Area are currently discharged to the soil column. Included in these wastestreams are cooling water, steam condensate, raw water, and sanitary wastewaters. It is the policy of the DOE that the use of soil columns to treat and retain radionuclides and nonradioactive contaminants be discontinued at the earliest practical time in favor of wastewater treatment and waste minimization. In 1989, the DOE entered into an interagency agreement with Ecology and EPA. This agreement is referred to as the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). Project W-252 is one of the projects required to achieve the milestones set forth in the Tri-Party Agreement. One of the milestones requires BAT/AKART implementation for Phase II streams by October 1997. This Functional Design Criteria (FDC) document provides the technical baseline required to initiate Project W-252 to meet the Tri-Party Agreement milestone for the application of BAT/AKART to the Phase II effluents.

324 (WHC-SD-WM-DP-075) Single Shell Tank Waste Characterization Project for Tank B-110, Core 9 - data package and PNL validation summary report. Pool, K.N.; Jones, T.E.; McKinley, S.G.; Tingey, J.M.; Longaker, T.M.; Gibson, J.A. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1990. 1506p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95005283. Source: OSTI; NTIS; INIS; GPO Dep.

This Data Package contains results obtained by Pacific Northwest Laboratory (PNL) staff in the characterization and analyses of Core 9 segments taken from the Single-Shell Tank (SST) 110B. The characterization and analysis of Core 9 segments are outlined in the Waste Characterization Plan for Hanford Site Single-Shell Tanks and in the Pacific Northwest Laboratory (PNL) Single-Shell Tank Waste Characterization Support FY 89/90 Statement of Work (SOW), Rev. 1 dated March, 1990. Specific analyses for each sub-sample taken from a segment are delineated in Test Instructions prepared by the PNL Single-Shell Tank Waste Characterization Project Management Office (SST Project) in accordance with procedures contained in the SST Waste Characterization Procedure Compendium (PNL-MA-599). Analytical procedures used in the characterization activities are also included in PNL-MA-599. Core 9 included five segments although segment 1 did not have sufficient material for characterization. The five samplers were received from Westinghouse Hanford Company (WHC) on 11/21-22/89. Each segment was contained in a sampler and was enclosed in a shipping cask. The shipping cask was butted up to the 325-A hot cell and the sampler moved into the hot cell. The material in the sampler (i.e., the segment) was extruded from the sampler, limited physical characteristics assessed, and photographed. At this point samples were taken for particle size and volatile organic analyses. Each segment was then homogenized. Sub-samples were taken for required analyses as delineated in the appropriate Test Instruction. Table 1 includes sample numbers assigned to Core 9 segment materials being transferred from 325-A Hot Cell. Sample numbers 90-0298, 90-0299, 90-0302, and 90-0303 were included in Table 1 although no analyses were requested for these samples. Table 2 lists Core 9 sub-sample numbers per sample preparation method.

325 (WHC-SD-WM-ER-333) Evaluation of heat sources in high-heat single shell tanks. Bander, T.J. Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003165. Source: OSTI; NTIS; INIS; GPO Dep.

This document reevaluates the heat load of single-shell tanks with high heat loads (>40,000 Btu/h). It summarizes recent reports on these high heat load tanks and reevaluates the heat load on those tanks not recently analyzed.

326 (WHC-SD-WM-MAR-003) Liquid Effluents Program mission analysis. Lowe, S.S. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001569. Source: OSTI; NTIS; INIS; GPO Dep.

Systems engineering is being used to identify work to cleanup the Hanford Site. The systems engineering process transforms an identified mission need into a set of performance parameters and a preferred system configuration. Mission analysis is the first step in the process. Mission analysis supports early decision-making by clearly defining the program objectives, and evaluating the feasibility and risks associated with achieving those objectives. The results of the mission analysis provide a consistent basis for subsequent systems engineering work. A mission analysis was performed earlier for the overall Hanford Site. This work was continued by a "capstone" team which developed a top-level

functional analysis. Continuing in a top-down manner, systems engineering is now being applied at the program and project levels. A mission analysis was conducted for the Liquid Effluents Program. The results are described herein. This report identifies the initial conditions and acceptable final conditions, defines the programmatic and physical interfaces and sources of constraints, estimates the resources to carry out the mission, and establishes measures of success. The mission analysis reflects current program planning for the Liquid Effluents Program as described in Liquid Effluents FY 1995 Multi-Year Program Plan.

327 (WHC-SD-WM-OTP-171) Operability test procedure for the TK-900 effluent monitoring station. Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005627. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure will verify that the 221-B liquid effluent monitoring system, installed near the east end of the 6-in. chemical sewer header, functions as intended by design. TK-900B was installed near stairwell 3 in the 221-B electrical gallery by Project W-007H. The system is part of BAT/AKART for the BCE liquid effluent system.

328 (WHC-SD-WM-PLN-096) Systems engineering implementation plan for the liquid effluents services program. Lowe, S.S. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006896. Source: OSTI; NTIS; INIS; GPO Dep.

A graded approach is being taken by the Liquid Effluents Services Program in implementing systems engineering because of the advanced state of the program. The approach is cost-effective and takes credit for related work already completed, yet retains the benefits of systems engineering. This plan describes how the Liquid Effluents Services Program will implement systems engineering so there is a common understanding. Systems engineering work to be performed and the products of that work are identified. The relation to the current planning process and integration with the sitewide systems engineering effort is described.

329 (WHC-SD-WM-TP-163) Liquid Effluent Monitoring Information System (LEMIS) test plans release 1.0. Adams, R.T. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 540p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002111. Source: OSTI; NTIS; INIS; GPO Dep.

The Liquid Effluent Monitoring Information System (LEMIS) is being developed as the organized information repository facility in support of the liquid effluent monitoring requirements of the Tri-Party Agreement. It is necessary to provide an automated repository into which the results from liquid effluent sampling will be placed. This repository must provide for effective retention, review, and retrieval of selected sample data by authorized persons and organizations. This System Architecture document is the aggregation of the DMR P+ methodology project management deliverables. Together they represent a description of the project and its plan through four Releases, corresponding to the definition and prioritization of requirements defined by the user.

330 (WHC-SD-WM-TP-164) Liquid Effluent Monitoring Information System (LEMIS) test plans release

1.1. Adams, R.T. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1994. 393p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000353. Source: OSTI; NTIS; INIS; GPO Dep.

The Liquid Effluent Monitoring Information System (LEMIS) is being developed as the organized information repository facility in support of the liquid effluent monitoring requirements of the Tri-Party Agreement. It is necessary to provide an automated repository into which the results from liquid effluent sampling will be placed. This repository must provide for effective retention, review, and retrieval of selected sample data by authorized persons and organizations. This System Architecture document is the aggregation of the DMR P+ methodology project management deliverables. Together they represent a description of the project and its plan through four Releases, corresponding to the definition and prioritization of requirements defined by the user.

331 (WHC-SD-WM-TP-165) Liquid Effluent Monitoring Information System test plans release 1.2. Adams, R.T. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 378p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002241. Source: OSTI; NTIS; INIS; GPO Dep.

The Liquid Effluent Monitoring Information System (LEMIS) is being developed as the organized information repository facility in support of the liquid effluent monitoring requirements of the Tri-Party Agreement. It is necessary to provide an automated repository into which the results from liquid effluent sampling will be placed. This repository must provide for effective retention, review, and retrieval of selected sample data by authorized persons and organizations. This System Architecture document is the aggregation of the DMR P+ methodology project management deliverables. Together they represent a description of the project and its plan through four Releases, corresponding to the definition and prioritization of requirements defined by the user.

332 (WHC-SP-1097) Liquid effluent/Hanford Environmental compliance FY 1995 Multi-Year Program Plan/Fiscal Year Work Plan, WBS 1.2.2.1 and 1.2.2.2. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 274p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001844. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the program effort to eliminate the use of the soil column for liquid effluent treatment and to manage current and future liquid effluent streams at the Hanford Site, in a safe responsible cost effective and legally compliant manner. This should be achieved through planning, public and stakeholder interaction, definition of requirements for generators, and provision of timely treatment, storage, disposal capability, and waste minimization of waste streams.

333 (WHC-SP-1124) RCRA and Operational Monitoring (ROM): Multi-Year Program Plan and Fiscal Year 95 Work Plan WBS 1.5.3. Westinghouse Hanford Co., Richland, WA (United States). 17 Sep 1994. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001576. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains information concerning the RCRA and Operational Monitoring Program at Hanford Reservation. Information presented includes: Schedules for ground

water monitoring activities, program cost baseline, program technical baseline, and a program milestone list.

334 (WSRC-MS-94-0252) In-situ demonstration of radio-frequency enhanced chlorinated hydrocarbon remediation. Kasevich, R.S. (KAI Technologies, Inc., Woburn, MA (United States)); Price, S.L.; Faust, D.L.; Jarosch, T.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9404174-1: New England environmental expo, Belmont, MA (United States), 26-28 Apr 1994). Order Number DE94013224. Source: OSTI; NTIS; GPO Dep.

This paper discusses the results of a successful demonstration of radio frequency (RF) heating for enhanced chlorinated hydrocarbon remediation at the M-Area Seepage Basin of the Department of Energy's Savannah River Site. RF heating was integrated with soil vapor extraction (SVE) to enhance the release of residual volatile chlorinated hydrocarbons which are concentrated in low permeable clay lenses in the unsaturated zone. Participants in this effort consisted of the Westinghouse Savannah River Technology Center; the Westinghouse Science and Technology Center (Pittsburgh, PA); and KAI Technologies, Inc. which provided the RF technology. Additionally, a better understanding of RF heating technology is gained through a description of the RF heating system.

335 (WSRC-MS-94-0323) Technology summary of the in situ bioremediation demonstration (methane biostimulation) via horizontal wells at the Savannah River Site Integrated Demonstration Project. Hazen, T.C. (Westinghouse Savannah River Co., Aiken, SC (United States)); Looney, B.B.; Fliermans, C.B.; Eddy-Dilek, C.A.; Lombard, K.H.; Enzien, M.V.; Dougherty, J.M.; Wear, J. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940815-18: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013289. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy, Office of Technology Development, has been sponsoring full-scale environmental restoration technology demonstrations for the past 4 years. The Savannah River Site Integrated Demonstration focuses on "Clean-up of Soils and Groundwater Contaminated with Chlorinated VOCs." Several laboratories including our own had demonstrated the ability of methanotrophic bacteria to completely degrade or mineralize chlorinated solvents, and these bacteria were naturally found in soil and aquifer material. Thus the test consisted of injection of methane mixed with air into the contaminated aquifer via a horizontal well and extraction from the vadose zone via a parallel horizontal well.

336 (WSRC-MS-94-0327) Organics in soils and groundwater at non-arid sites (A-1) integrated demonstration. Steele, J.L.; Kaback, D.S.; Looney, B.B. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940815-32: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013284. Source: OSTI; NTIS; INIS; GPO Dep.

One of the most common environmental problems in the United States is soils and groundwater contaminated with volatile chemical solvents classified as Volatile Organic Compounds (VOCs), which were used as degreasers and cleaning agents. Leakage of solvents (trichloroethylene and tetrachloroethylene) from an underground process sewer line has contaminated soils and underlying groundwaters at SRS. This site was chosen for DOE-OTD's integrated demonstration program to demonstrate innovative technologies for cleanup of soils and groundwater contaminated with VOCs. The Savannah River Site was especially well suited as the test bed for this integrated demonstration project due to the presence of a pre-existing line source of soil and groundwater-based contamination, on-going environmental remediation efforts at the site, and full cooperation from the concerned environmental regulatory agencies. The Integrated Demonstration (ID) at the Savannah River Site has demonstrated systems of technologies and evaluated them with respect to performance, safety and cost effectiveness.

337 (WSRC-MS-94-0341) Three-dimensional modeling of subsurface contamination: A case study from the radio frequency-heating demonstration at the Savannah River Site. Poppy, S.P. (South Carolina Univ., Aiken, SC (United States)); Eddy-Dilek, C.A.; Jarosch, T.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940815-70: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015548. Source: OSTI; NTIS; INIS; GPO Dep.

Computer based three-dimensional modeling is a powerful tool used for visualizing and interpreting environmental data collected at the Savannah River Site (SRS). Three-dimensional modeling was used to image and interpret subsurface spatial data, primarily, changes in the movement, the accumulation, and the depletion of contaminants at the Integrated Demonstration Site (IDS), a proving ground for experimental environmental remediation technologies. Three-dimensional models are also educational tools, relaying complex environmental data to interested non-technical individuals who may be unfamiliar with the concepts and terminology involved in environmental studies. The public can draw their own conclusions of the success of the experiments after viewing the three-dimensional images set up in a chronological order. The three-dimensional grids generated during these studies can also be used to create images for visualization and animated sequences that model contamination movement. Animation puts the images of contamination distribution in motion and results in a new perspective on the effects of the remedial demonstration.

338 (WSRC-RP-94-276) Physicochemical and mineralogical controls on colloid migration and deposition within sediments on the Savannah River Site. Strom, R.N.; Looney, B.B.; Seaman, J.C.; Bertsch, P.M.; Miller, W.P. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94014868. Source: OSTI; NTIS; INIS; GPO Dep.

Reinjection of treated groundwater from the F-Area and H-Area seepage basins may produce conditions where stable colloidal suspensions are generated that lead to permeability reductions in receiving zones in the aquifer or to anomalously high concentrations of particulates in monitoring well samples. In order to determine the conditions under

which stable colloids are generated in Savannah River Site (SRS) sediments, the Savannah River Ecology Laboratory (SREL) and the University of Georgia (UGA) undertook bulk dispersibility and column experiments. The sediments used are representative of the natural matrix materials in the upper most aquifers in the general separations area. The study indicated that the sediment surfaces are sensitive to slight changes in solution chemistry and that outside the natural range of pH conditions, stable colloids are generated. At low pH values, positive-charged dilute colloidal suspensions are formed, whereas at high pH values, combined with high sodium adsorption ratios, more turbid suspensions are formed that are capable of causing receiving zone clogging. In dilute, poorly buffered solutions, ion exchange reactions influence the pH of the solutions and changes up to 1 pH unit were observed as a result of these reactions. The direction and magnitude of the solution pH change was predictable and dependent on the species of cations and anion in the simulated injectate. Recommendations for maintaining capability between the receiving sediments and the injection waters include maintaining the pH of the water between 5.5 to 6.5, maintaining a balance between "acidogenic" and "alkalinogenic" ions to stabilize the pH, and maintaining a low to moderately low ionic strength.

339 (WSRC-RP-94-607) A/M Area Groundwater Corrective Action Southern Sector Remediation Technology Alternatives Evaluation. Looney, B.B.; Phifer, M.A. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Jun 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94016536. Source: OSTI; NTIS; INIS; GPO Dep.

Several technologies for clean up of solvents such as trichloroethylene, from groundwater were examined to determine the most reasonable strategy for the southern Sector in A/M Area of Savannah River Site. The most promising options identified were: pump and treat technology, airlift recirculation technology, and bioremediation technology. These options range from baseline/traditional methods to more innovative technologies. The traditional methods would be straightforward to implement, while the innovative methods have the potential to improve efficiency and reduce long term costs.

340 (WSRC-TR-93-540-Vol.1) Operations Support of Phase 2 Integrated Demonstration In Situ Bioremediation: Volume 1, Final report: Final report text data in tabular form, Disk 1. Hazen, T.C. (Westinghouse Savannah River Co., Aiken, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States); ECOVA Corp., Redmond, WA (United States). Sep 1993. 617p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94014274. Source: OSTI; NTIS; GPO Dep.

This project was designed to demonstrate in situ bioremediation of ground water and sediment contaminated with chlorinated solvents. Indigenous microorganisms were stimulated to degrade trichloroethylene (TCE), tetrachloroethylene (PCE) and their daughter products in situ by addition of nutrients to the contaminated aquifer and adjacent vadose zone. The principle carbon/energy source nutrient used in this demonstration was methane (natural gas). In situ biodegradation is a highly attractive technology for remediation because contaminants are destroyed, not simply moved to another location or immobilized, thus decreasing costs,

risks, and time, while increasing efficiency, safety, and public and regulatory acceptability. This report describes the preliminary results of the demonstration and provides conclusions only for those measures that the Bioremediation Technical Support Group felt were so overwhelmingly convincing that they do not require further analyses. Though this report is necessarily superficial it does intend to provide a basis for further evaluating the technology and for practitioners to immediately apply some parts of the technology.

341 (WSRC-TR-93-540-Vol.2) Operations Support of Phase 2 Integrated Demonstration In Situ Bioremediation: Volume 2, Final report: Data in tabular form, Disks 2,3,4. Hazen, T.C. (Westinghouse Savannah River Co., Aiken, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States); ECOVA Corp., Redmond, WA (United States). Sep 1993. 803p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94014275. Source: OSTI; NTIS; GPO Dep.

This document consists solely of data acquired during phase 2 of the integrated demonstration project concerning in situ bioremediation performed at the Savannah River Site, Aiken, South Carolina. The data is presented in tabular form.

342 (WSRC-TR-93-540-Vol.3) Operations Support of Phase 2 Integrated Demonstration In Situ Bioremediation: Volume 3, Final report: Data in graphical form, Disks 1,2,3,4; Averaged data in tabular form, Disks 1,2. Hazen, T.C. (Westinghouse Savannah River Co., Aiken, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States); ECOVA Corp., Redmond, WA (United States). Sep 1993. 468p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94014276. Source: OSTI; NTIS; GPO Dep.

This document contains data collected during the demonstration of in situ bioremediation at Savannah River Site. This project was designed to demonstrate in situ bioremediation of ground water and sediment contaminated with chlorinated solvents. Indigenous microorganisms were stimulated to degrade trichloroethylene, tetrachloroethylene and their daughter products in situ by addition of nutrients to the contaminated aquifer and adjacent vadose zone. The principle carbon/energy source nutrient used in this demonstration was methane. In situ biodegradation is a highly attractive technology for remediation because contaminants are destroyed, not simply moved to another location or immobilized, thus decreasing costs, risks, and time, while increasing efficiency, safety, and public and regulatory acceptability.

343 (WSRC-TR-93-540-Vol.4) Operations Support of Phase 2 Integrated Demonstration In Situ Bioremediation: Volume 4, Final report: Averaged data in tabular form, Disks 3,4; Averaged data in graphical form, Disks 1,2,3,4. Hazen, T.C. (Westinghouse Savannah River Co., Aiken, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States); ECOVA Corp., Redmond, WA (United States). Sep 1993. 493p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94014277. Source: OSTI; NTIS; GPO Dep.

This report contains experimental data collected during the demonstration of in situ bioremediation at the Savannah River Site. This project was designed to demonstrate in situ bioremediation of ground water and sediment contaminated

with chlorinated solvents. Indigenous microorganisms were stimulated to degrade trichloroethylene, tetrachloroethylene, and their daughter products in situ by addition of nutrients to the contaminated aquifer and adjacent vadose zone. The principle carbon/energy source nutrient used in this demonstration was methane. In situ biodegradation is a highly attractive technology for remediation because contaminants are destroyed, not simply moved to another location or immobilized, thus decreasing costs, risks, and time, while increasing efficiency, safety, and public and regulatory acceptability.

344 (WSRC-TR-94-0286-E-Rev.1) **Results of the quarterly tritium survey of Fourmile Branch and its seepines in the F- and H-Areas of SRS: September 1993. Revision 1.** Dixon, K.L.; Rogers, V.A.; Looney, B.B. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95004410. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Sciences Section (ESS) established a quarterly monitoring program of the Fourmile Branch (FMB) seepine down gradient from the F- and H-Area seepage basins. The program surveys and tracks changes in tritium, specific conductivity, and pH for the seepine water. Measurements from the sixth quarterly survey (September 1993) showed higher tritium and conductivity measurements and higher pH values (pH 5-6) than measurements from previous studies. Increased tritium concentrations and conductivity values, as compared to previous surveys, were attributed to decreased rainfall prior to the sampling event. However, overall results of the tritium survey and stream monitoring data (Looney et al., 1993) suggest that the tritium plume is flushing from the FMB system.

345 (WSRC-TR-94-0286-ESS) **Results of the quarterly tritium survey of Fourmile Branch and its seepines in the F- and H-Areas of SRS: September 1993.** Dixon, K.L.; Rogers, V.A.; Looney, B.B. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95000499. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Sciences Section (ESS) established a quarterly monitoring program of the Fourmile Branch (FMB) seepine down gradient from the F- and H-Area seepage basins. The program surveys and tracks changes in tritium, specific conductivity, and pH for the seepine water. Measurements from the sixth quarterly survey (September 1993) showed higher tritium and conductivity measurements and higher pH values (pH 5 - 6) than measurements from previous studies. Increased tritium concentrations and conductivity values, as compared to previous surveys, were attributed to decreased rainfall prior to the sampling event. However, overall results of the tritium survey and stream monitoring data (Looney et al., 1993) suggest that the tritium plume is flushing from the FMB system.

346 (WSRC-TR-94-0346) **H-Area, K-Area, and Par Pond Sewage Sludge Application Sites groundwater monitoring report: Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002697. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater samples from the three wells at the H-Area Sewage Sludge Application Site (HSS wells) are analyzed

quarterly for constituents as required by South Carolina Department of Health and Environmental Control (SCDHEC) Construction Permit 12,076. Samples from the three wells at the K-Area Sewage Sludge Application Site (KSS wells) and the three wells at the Par Pond Sewage Sludge Application Site (PSS wells) are analyzed quarterly for constituents required by SCDHEC Construction Permit 13,173. All samples are also analyzed as requested for other constituents as part of the Savannah River Site (SRS) Groundwater Monitoring Program. Annual analyses for other constituents, primarily metals, also are required by the permits. No constituents exceeded the SCDHEC final Primary Drinking Water Standard in any well from the H-Area, K-Area, and Par Pond Sewage Sludge Application Sites. Aluminum, iron, lead, and manganese, which were above standards and Flag 2 criteria in one or more wells in the three sites during first quarter 1994, were not analyzed this quarter. Second quarter results are similar to results for fourth quarter 1993.

347 (WSRC-TR-94-0347) **F-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002698. Source: OSTI; NTIS; INIS; GPO Dep.

During second quarter 1994, samples from the FAC monitoring wells at the F-Area Acid/Caustic Basin were collected and analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclide indicators, volatile organic compounds, and other constituents. Piezometer FAC 5P and monitoring well FAC 6 were dry and could not be sampled. Analytical results that exceeded final Primary Drinking Water Standards (PDWS), other Savannah River Site (SRS) Flag 2 criteria, or the SRS turbidity standard of 50 NTU during the quarter were as follows: gross alpha exceeded the final PDWS and aluminum, iron, manganese, and total organic halogens exceeded the SRS Flag 2 criteria in one or more of the FAC wells. Turbidity exceeded the SRS standard in well FAC 3. Groundwater flow direction and rate in the water table beneath the F-Area Acid/Caustic Basin were similar to past quarters.

348 (WSRC-TR-94-0348) **H-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002696. Source: OSTI; NTIS; INIS; GPO Dep.

During second quarter 1994, samples collected from the four HAC monitoring wells at the H-Area Acid/Caustic Basin received comprehensive analyses (exclusive of boron and lithium) and turbidity measurements. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS) or the Savannah River Site (SRS) flagging criteria or turbidity standard during the quarter are the focus of this report. Tritium exceeded the final PDWS in all four HAC wells during second quarter 1994. Carbon tetrachloride exceeded the final PDWS in well HAC 4. Aluminum exceeded its Flag 2 criterion in wells HAC 2, 3, and 4. Iron was elevated in wells HAC 1, 2, and 3. Manganese exceeded its Flag 2 criterion in well HAC 3. Specific conductance and total organic halogens were elevated in well HAC 2. No well samples exceeded the SRS turbidity standard. Groundwater flow direction in the water table beneath the H-Area Acid/Caustic Basin was to the west during second quarter 1994. During previous quarters, the groundwater flow direction has been consistently to the northwest or the north-northwest.

This apparent change in flow direction may be attributed to the lack of water elevations for wells HTF 16 and 17 and the anomalous water elevations for well HAC 2 during second quarter.

349 (WSRC-TR-94-0387) **Wastewaters at SRS where heavy metals are a potential problem.** Wilde, E.W.; Radway, J.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 35p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002685. Source: OSTI; NTIS; INIS; GPO Dep.

The principal objective of this report is to identify and prioritize heavy metal-containing wastewaters at the Savannah River Site (SRS) in terms of their suitability for testing of and clean-up by a novel bioremediation process being developed by SRTC. This process involves the use of algal biomass for sequestering heavy metal and radionuclides from wastewaters. Two categories of SRS wastewaters were considered for this investigation: (1) waste sites (primarily non-contained wastes managed by Environmental Restoration), and (2) waste streams (primarily contained wastes managed by Waste Management). An attempt was made to evaluate all sources of both categories of waste throughout the site so that rational decisions could be made with regard to selecting the most appropriate wastewaters for present study and potential future treatment. The investigation included a review of information on surface and/or groundwater associated with all known SRS waste sites, as well as waters associated with all known SRS waste streams. Following the initial review, wastewaters known or suspected to contain potentially problematic concentrations of one or more of the toxic metals were given further consideration.

350 (WSRC-TR-94-0425) **Hydrologic budget for A/M Area, Savannah River Site.** Hiergesell, R.A.; Haselow, J.S.; Jackson, D.G.; Ehrke, L. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001473. Source: OSTI; NTIS; INIS; GPO Dep.

In this investigation different components of the hydrologic budget for the groundwater flow system beneath the A/M Area were quantified. To accomplish this a regional groundwater flow model, previously calibrated to the groundwater flow system beneath the A/M Area, was used to generate flux terms which could then be used to quantify specific components of the hydrologic budget. Sub-zones within the constructed model were defined in terms of groups of model nodes using the US Geological Survey code ZONEBUDGET. Cell-by-cell flux terms generated by the groundwater model for each node were used as input to calculate the hydrologic budgets for each of the defined sub-zones. Results were tabulated both as actual groundwater fluxes and as normalized quantities to allow easy comparison of flux magnitudes for different sub-zones. In the process of defining sub-zones and calculating the flux magnitude for different components of the hydrologic flow system, the adequacy of the groundwater flow model in describing the actual flow system was better determined. In effect, quantification of flux terms from the groundwater model functioned as a "calibration tool" in that specific changes to the groundwater model which would enhance its calibration were identified and are described in this report.

351 (WSRC-TR-94-0544) **Plant community development within the F- and H-Area tree-kill zone.** Nelson,

E.A.; Westbury, H.M. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005486. Source: OSTI; NTIS; GPO Dep.

The F- and H-Area Seepage Basins received liquid waste from the F and H chemical separation facilities from 1955 through 1988. Tree mortality in seepage fed wetlands down-slope from the basins was observed in the late 1970's, and investigations were conducted to determine the cause and source of the impacts. Analysis of the soil and water in the tree-kill zones demonstrated a strong chemical linkage with the F- and H-Area seepage basins. Although no single cause of the mortality was determined, it was believed to be the result of interactions of alterations in the hydrology and erosional deposition, along with lowering of pH and increased conductivity, sodium, aluminum, and nitrogen compounds. A mild drought during the growing season may also have increased the concentration of the chemical contaminants in the soils matrix. In 1988, the F- and H-Area Seepage Basins were closed and covered with a clay cap to reduce the rate of dispersion of the contaminants in the soil beneath the basins. Subsequent studies of the chemical composition of the tree-kill zone groundwater and toxicological characteristics of the seepage soil have shown a reduced contaminant flux. In 1993, an initial vegetation study was undertaken to determine the level of recovery by the plant communities in the tree-kill zones. This study repeats the initial vegetation investigation in order to further analyze and characterize the recovery of plant communities in the zones after an additional year of growth.

352 **Environmental sampling and analysis as a safeguards tool.** Wogman, N.A. (Battelle Pacific Northwest Lab., Richland, WA (United States)); Perkins, R.W.; Holdren, G.R. pp. 443-452 of International nuclear safeguards 1994: Vision for the future. V.1. Proceedings of a symposium held in Vienna, 14-18 March 1994. IAEA, Vienna (Austria) (Jul 1994). pp. 839 (CONF-940307-; International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994; STI/PUB-945.).

Results from the operations of the Hanford production facilities are discussed and indicate the type of signatures that may be expected from plutonium production facilities. These signatures include noble gas emissions from the reactors and chemical separation processes, the production of radionuclides in reactor cooling water, followed by their subsequent release to the Columbia River, and the release of mildly contaminated process water from the chemical processing facilities. These signature materials are carried by both gaseous and liquid effluents and enter various compartments of the environment. The types of signature materials that are most likely to be released and the environmental compartments where they are likely to be accumulated are discussed, and examples of the quantities that have been released during past separations are given. There are numerous processes by which natural uranium can be enriched to produce highly enriched ^{235}U . The most definitive signature of such processes is always a modification in the uranium isotope ratios, and materials showing either enriched or depleted uranium in gaseous and liquid effluents provide the best indication that uranium enrichment processes are taking place. Therefore, techniques for sampling and analysis of airborne, waterborne or deposited

uranium in environmental matrices provide a means of detecting uranium enrichment which may lead to products that can be used in proliferation activities. 12 refs, 2 tabs.

353 Radionuclide analysis techniques for safeguards. Perkins, R.W. (Battelle Pacific Northwest Lab., Richland, WA (United States)); Wogman, N.A. pp. 465-474 of *International nuclear safeguards 1994: Vision for the future*. V.1. Proceedings of a symposium held in Vienna, 14-18 March 1994. IAEA, Vienna (Austria) (Jul 1994). pp. 839 (CONF-940307--: International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994; STI/PUB-945.).

The signatures of radionuclides that were released in reactor effluent water during the operation of the Hanford reactors are considered and their utility for detecting covert nuclear reactor operations is discussed. For reactors with a design similar to that of the Hanford reactors, which employed natural uranium and once-through cooling, a spectrum of radionuclides similar to those discharged from the Hanford reactors would be expected. The concentrations of radionuclides in reactor discharge water, in various stretches of the Columbia River and in the Pacific Ocean are presented, and possible analytical techniques for their collection and measurement are discussed. The utility of the various reactor effluent radionuclides as signatures of reactor operation as a function of time since discharge is considered on the basis of the half-lives of the radionuclides and the relative ease of collection and analysis. (author). 7 refs, 3 figs, 2 tabs.

354 Porphyrins as heavy metal sensor. Datta-Gupta, N. (South Carolina State Univ., Orangeburg, SC (United States)); Ghosh, J.K.; Prioleau, T.; Edwards, V.; O'Rourke, P.E. pp. 91, Paper ANYL 23 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 Grant GM-08060. (CONF-940301--: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

There is a great need of toxic metal sensors for continuous real-time monitoring in aqueous solution to correct and manage environmental pollution. Porphyrins can be used for making optical sensors for metals, and metalloporphyrins for certain gas molecules. The authors have studied the interaction of three heavy toxic metals - Pb(+2), Cd(+2) and Hg(+2) - with TPPS4 in the pH range of 5 thru 9, by titrating a solution of the porphyrin with the metal nitrate solution. The porphyrin-metal interaction was monitored with an HP diode array spectrometer, fitted with optical fibers and a diprobe. Aliquot of metal solution was added to a solution of TPPS4 with an autotitrator. Absorption spectra were collected after each addition and stored. The whole operation as well as calculation of titration data were carried out with a custom made program. Results are presented. The authors are now immobilizing selected porphyrins on glass surfaces to make field-usable optical sensors and studying them.

355 An efficient technique for locating and removing dense non-aqueous phase liquids in-situ. LaVenue, A.M.; Jackson, R.E. pp. 106-125 of *PETRO-SAFE '94 conference papers: Book 2: Volume 5: Emergency response & spill control; Volume 6: Remediation; Volume 7: Health & safety issues*. PennWell Conferences & Exhibitions, Houston, TX (United States) ([1994]). pp. 409 (CONF-940171--: Petro-Safe '94: 5th annual environmental, safety and health conference and exhibition for the oil, gas and petrochemical industries, Houston, TX (United States), 25-27 Jan 1994).

To hydrogeologists, chlorinated hydrocarbons (CHCs) such as trichloroethylene (TCE) are known as dense, non-aqueous phase liquids (DNAPLs) and are believed to play a major role in the failure of pump-and-treat remediation systems to attain health-based limits of decontamination within short periods of operation. It is most probable that groundwater contamination by CHCs is most frequently caused by the dissolution of CHCs present in the subsurface as DNAPLs but not identified as such in any soil or rock cores or in any groundwater sample. It has been pointed out that a dissolved-phase plume of CHCs should be interpreted, a priori, as an indicator of an as-yet unlocated DNAPL zone in the subsurface. The purpose of this article is to briefly review the processes controlling DNAPL migration and dissolution in the subsurface and present a new technique for locating and characterizing DNAPL in-situ. This paper will concentrate on chlorinated solvents because of their importance in industrial process.

356 Disposition of actinides released from high-level waste glass. Ebert, W.L. (Argonne National Lab., IL (United States)); Bates, J.K.; Buck, E.C.; Gong, M.; Wolf, S.F. pp. 231-241 of *Ceramic transactions: Environmental and waste management issues in the ceramic industry II*. Volume 45. Bickford, D.; Bates, S.; Jain, V.; Smith, G. (eds.). American Ceramic Society, Westerville, OH (United States) (1994). pp. 513 DOE Contract W-31109-ENG-38. (CONF-940416--: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994).

The disposition of actinide elements released from high-level waste glasses into a tuff groundwater in laboratory tests at 90°C at various glass surface area/leachant volume ratios (S/V) between dissolved, suspended, and sorbed fractions has been measured. While the maximum release of actinides is controlled by the corrosion rate of the glass matrix, their solubility and sorption behavior affects the amounts present in potentially mobile phases. Actinide solubilities are affected by the solution pH and the presence of complexants released from the glass, such as sulfate, phosphate, and chloride, radiolytic products, such as nitrate and nitrite, and carbonate. Sorption onto inorganic colloids formed during glass corrosion may increase the amounts of actinides in solution, although subsequent sedimentation of these colloids under static conditions leads to a significant reduction in the amount of actinides in solution. The solution chemistry and observed actinide behavior depend on the S/V of the test. Tests at high S/V lead to higher pH values, greater complexant concentrations, and generate colloids more quickly than tests at low S/V. The S/V also affects the rate of glass corrosion.

357 Horizontal environmental wells: A summary and a survey. Wilson, D.D. (CDM Federal Programs Corp., Golden, CO (United States)); Kaback, D.S. pp. 330-335 of *Superfund XIV conference and exhibition: Proceedings. Volume 1. Hazardous Materials Control Resources Inst.*, Rockville, MD (United States) (1994). pp. 760 (CONF-9311122--: Superfund 14: conference and exhibition, Washington, DC (United States), 30 Nov - 2 Dec 1993).

Vertical wells are extensively used in ground water pump and treat remediation systems and in soil gas extraction and injection systems. However, subsurface contamination is generally found in vertically-limited and horizontally-extended zone; vertical wells are geometrically limited in exposing the maximum well screen area to the zone of interest. Horizontal environmental remediation wells maximize

the screen area in the zone of interest and the effectiveness of the extraction or injection systems. Horizontal environmental wells are increasingly being used to install subsurface extraction systems. A survey of the directional drilling industry has determined that over 100 horizontal wells have been installed as of July 1993. Approximately one-quarter of the wells installed were ground water pump and treat wells have been installed, one-quarter were soil vapor extraction wells, and half of the wells were used for product recovery, air sparging, in situ stripping, and drains. The majority of the wells have been installed at depths of less than 25 ft. vertical depth. The cost of the horizontal wells is directly related to the vertical depth of the installation, site geology, well materials, and the length of the well.

358 Neptunium hydrolysis and carbonate complexation. Palmer, P.D. (Los Alamos National Lab., NM (United States)); Clark, D.L.; Newton, T.W.; Ford, D.K.; Tait, C.D.; Ekberg, S.A.; Smith, P.H. pp. 419, Paper TECH 6 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Neptunium is one of the primary elements of concern when studying the chemistry of actinides under environmental conditions. Under typical environmental conditions, neptunium will be present as one of the dioxo cations NpO_2^{2+} and NpO_2^+ . Since actinide ions are strongly complexed by carbonate ligands in groundwater, hydrolysis and CO_3^{2-} complexation represent the two most important chemical processes influencing their behavior in the environment. However, the existing literature regarding the thermodynamics and speciation of these ions contains inconsistencies. In order to confirm or refute the existing literature the authors are investigating these important processes using several different techniques. The hydrolysis and CO_3^{2-} complexation have been examined by species-specific structural probes such as ^{13}C and ^{17}O NMR as a function of $\text{p}[\text{H}]$, and by more traditional spectrophotometric and pH titration methods. Combined, these techniques give a more complete description of the important species and chemical processes in solution. The results of the NMR experiments show two NpO_2^{2+} - carbonate species present in the relevant $\text{p}[\text{H}]$ region under conditions of high ionic strength (2.5 M). These results are discussed along with results from ongoing experiments.

359 Kinetic modeling of the biological destruction of carbon tetrachloride. Hooker, B.S. (Tri-State Univ., Angola, IN (United States)); Skeen, R.S.; Peterson, J.N. pp. 531, Paper ENVR 36 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

A denitrifying consortium capable of transforming carbon tetrachloride (CCl_4) was cultured from an aquifer soil sample from the DOE Hanford Site in southeastern Washington State. A mathematical description of the kinetics of CCl_4 destruction by the Hanford groundwater microbial consortium is formulated and its predictions are compared to experimental data. The model relates the destruction of CCl_4 to both assimilatory and dissimilatory denitrification reactions through a cometabolic pathway and was successful in the

prediction of acetate, nitrate, nitrite, TSS, and CCl_4 concentrations for the twelve diverse experiments. No statistically significant interaction was seen between model parameter values and individual test conditions. In addition, the developed model has been successfully applied to a long-term, batch CCl_4 destruction study using the Hanford consortium in actual Hanford groundwater.

360 Treatment tests for chromate, nitrate, and uranium removal from Hanford groundwaters. Beck, M.A. (Westinghouse Hanford Co., Richland, WA (United States)); Duncan, J.B. pp. 577, Paper ENVR 196 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The Hanford Site is a 640-mi² area in Washington State formerly used for national defense plutonium production. The 100 Area of the Hanford Site is the production reactor area along a 15-mile stretch on the Columbia River. As a result of reactor operations, the groundwaters under the 100 Area contain chromate, nitrate, and uranium above standard groundwater protection limits. The goal of the present study is to determine which remediation method is the most appropriate, and to provide preliminary process information. The authors performed bench-scale studies on chemical reduction/precipitation, coprecipitation, and anion exchange to determine the removal efficiency of each of the methods. The authors found that chemical reduction removed only chromate and coprecipitation removed only uranium. Anion exchange removed chromate and uranium concentrations to below the project performance goals of 100 ppb (chromate) and 22 ppb (uranium) for over 1,000 column volumes. The nitrate concentration was lowered below the performance goal of 45 ppm for about 350 column volumes.

361 Physical and mathematical modeling of toluene diffusion and biodegradation in unsaturated sandy soil. Sa, L. (Oregon Graduate Institute of Science & Technology, Portland, OR (United States)); Johnson, R.L.; Boone, D.R. pp. 581, Paper ENVR 211 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Column experiments were conducted to study the effects of vapor phase diffusion and biodegradation upon toluene migration in sandy soil at uniform residual water content. The concentrations of toluene, oxygen, and carbon dioxide in soil air along the column length were measured with time. In addition, batch kinetic experiments and numeric modeling were carried out to aid in the identification and quantification of various factors controlling movement in the unsaturated medium. General conclusions drawn from this research are (1) in an unsaturated sandy soil environment, the bioavailable nitrogen is the limiting factor in the microbially mediated process of removing volatile aromatic contaminants; (2) near an immiscible contaminant source, vapor diffusion is dominant, and biodegradation may be inhibited due to high concentration; and (3) parameters associated with microbial processes such as the initial population, the maximum growth rate, and nitrogen availability have a substantial impact on the migration of pollutants.

362 Investigation of the uranyl/oxalate co-contaminant system sorbed on a Wyoming smectite. Matzner, R.A. (Los Alamos National Lab., NM (United

States)); Berg, J.M.; Chisholm-Brause, C.J.; Morris, D.E. pp. 586-587, Paper ENVR 229 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Using optical spectroscopy (luminescence and Raman), the authors are characterizing the sorption complexes of UO_2^{2+} and UO_2^{2+} -oxalate ($\text{C}_2\text{O}_4^{2-}$) mixtures on a sodium-saturated Wyoming montmorillonite (SWy-1) as functions of solution pH ($\sim 3.5 - 7$), ionic strength (0.001 - 0.1 M), and uranyl-to-oxalate ratio (1:5 and 1:25). In the absence of oxalate, the authors have clearly identified two types of uranyl sorption complexes; exchange-site complexes that dominate at low pH and low ionic strength in which the uranyl moiety is indistinguishable from the aquated monomer in solution, and edge-site complexes in which the uranyl has spectroscopic properties similar to hydrolyzed uranyl species in solution. In the presence of excess oxalate, uranyl oxalate complexes (ML , ML_2^{2-}) are formed in solution. Oxalate complexation inhibits the onset of uranyl hydrolysis (e.g., at 1:25 metal:ligand ratio with ~ 10 mM total UO_2^{2+} , no hydrolysis is observed up to pH 6.5). However, because these complexes are neutral or anionic, and stable to relatively high pH, sorption reactions on SWy-1 are expected to differ from those seen for the hydrolysis products in the absence of oxalate. New results on the sorption chemistry in this ternary system are presented and compared to the sorption behavior observed in the absence of oxalate.

363 Graphite electrode DC arc technology program for buried waste treatment. Wittle, J.K. (Electro-Pyrolysis, Inc., Wayne, PA (United States)); Hamilton, R.A.; Cohn, D.R.; Woskov, P.P.; Thomas, P.; Surma, J.E.; Titus, C.H. pp. 953-959 of Superfund XIV conference and exhibition: Proceedings, Volume 2. Hazardous Materials Control Resources Inst., Rockville, MD (United States) (1994). pp. 710 DOE Contract AC06-76RL01830. (CONF-9311122-: Superfund 14: conference and exhibition, Washington, DC (United States), 30 Nov - 2 dec 1993).

The goal of the program is to apply EPI's Arc Furnace to the processing of Subsurface Disposal Area (SDA) waste from Idaho National Engineering Laboratory. This is being facilitated through the Department of Energy's Buried Waste Integrated Demonstration (BWID) program. A second objective is to apply the diagnostics capability of MIT's Plasma Fusion Center to the understanding of the high temperature processes taking place in the furnace. This diagnostics technology has promise for being applicable in other thermal treatment processes. The program has two parts, a test series in an engineering-scale DC arc furnace which was conducted in an EPI furnace installed at the Plasma Fusion Center and a pilot-scale unit which is under construction at MIT. This pilot-scale furnace will be capable of operating in a continuous feed and continuous tap mode. Included in this work is the development and implementation of diagnostics to evaluate high temperature processes such as DC arc technology. This technology can be used as an effective stabilization process for Superfund wastes.

364 Simulation of DNAPL migration and surfactant enhanced aquifer remediation. Pickens, J.F. (INTERA Inc., Austin, TX (United States)); Jackson, R.E.; Statham, W.H.; Brown, C.L.; Pope, G.A. pp. 391-412 of Fifth annual environmental management and technology conference/Southwest: Technical papers. Advanstar Expositions, Glen Ellyn, IL (United States) (1993). pp. 640 (CONF-9309325-:

HazMat Southwest '93: 5th annual environmental management and technology conference, Dallas, TX (United States), 28-30 Sep 1993).

Dense non-aqueous phase liquids (DNAPLs) pose a serious ground-water contamination problem at many industrial and hazardous waste sites. The two-phase immiscible flow of DNAPLs in heterogeneous geologic media is a complex process controlled by gravitational, capillary, and viscous forces. The UTCHEM multiphase code was applied to simulate two-phase immiscible flow of perchloroethylene (PCE) in a laboratory experiment (for model validation purposes) and to simulate a field-scale application of a hypothetical PCE spill event in a heterogeneous system and comparison of the subsequent remediation by pump-and-treat operations using injection of either water or a surfactant solution. The remediation simulations demonstrate that surfactant enhanced aquifer remediation involving injection of a surfactant solution and removal at recovery wells is a practical remediation technology. Remediation times for pump-and-treat operations may be reduced by one or more orders of magnitude depending on factors such as the capability of the surfactant solution to access and solubilize the DNAPLs.

365 Development of a method for the direct purge analysis of volatile organics in water. Wise, M.B. (Oak Ridge National Laboratory, TN (United States)); Buchanan, M.V.; Guerin, M.R.; Merriweather, R.; Bayne, C.K. pp. 126A-126B of Proceedings of the 41st ASMS conference on mass spectrometry and allied topics. ASMS, East Lansing, MI (United States) (1993). pp. 1158 DOE Contract AC05-84OR21400. (CONF-9305222-: 41. American Society of Mass Spectrometry conference on mass spectrometry and allied topics, San Francisco, CA (United States), 30 May - 4 jun 1993).

Direct Sampling Ion Trap Mass Spectrometry (DSITMS) has been under development in this laboratory for a number of years as a means of rapidly detecting and quantifying volatile organic compounds (VOCs) in environmental samples. Over the past years, efforts have focused primarily on the development and modification of instrumentation for field and laboratory applications of DSITMS. Early data generation efforts were mostly aimed at the acquisition of pilot data which demonstrated the utility of the DSITMS technique. As this technology has started to mature and gain acceptance among other users, it has become necessary to develop concise analytical procedures and generate the validation data to support regulatory acceptance of DSITMS methods.

366 Considerations for the size and power reduction of a field transportable ion trap mass spectrometer. Wise, M.B.; Buchanan, M.V.; Thompson, C.V.; Goeringer, D.E.; McLuckey, S.A.; Crutcher, R.L.; Hileman, M.S.; Emery, M.L.; Alley, G.T. pp. 438A-438B of Proceedings of the 41st ASMS conference on mass spectrometry and allied topics. ASMS, East Lansing, MI (United States) (1993). pp. 1158 DOE Contract AC05-84OR21400. (CONF-9305222-: 41. American Society of Mass Spectrometry conference on mass spectrometry and allied topics, San Francisco, CA (United States), 30 May - 4 jun 1993).

The versatility, sensitivity, and mechanical simplicity of ion trap mass spectrometers makes them an excellent choice for use as field instruments. Applications include on-site environmental monitoring, process monitoring, leak and spill detection, contraband detection, indoor air monitoring, and workplace monitoring, among others. Although modified versions of the Finnigan ITD and ITS-40 have been successfully used as field transportable mass spectrometers,

increased analytical capabilities as well as further reductions in size, weight, power consumption, and instrument complexity are needed to expand the range of potential field applications. The authors have approached this task by modifying the electronics and developing down-sized replacements for many of the associated components. Small, high-efficiency vacuum pumps have also been used to reduce the weight and power consumption. The results have been used to reduce the weight and power consumption. The result has been the development of a field instrument which has all of the capabilities of a full-sized laboratory ITMS in a package occupying approximately 8 ft³ and weighing approximately 100 pounds.

367 Estimating DNAPL composition and VOC dilution from extraction well data. Jackson, R.E. (INTERA Inc., Austin, TX (United States)); Mariner, P.E. *Ground Water (United States)*; 33(3): 407-414 (May-Jun 1995).

Field data from a large-scale ground-water extraction system at the Savannah River Site in South Carolina indicate that considerable dilution of volatile organic compounds (VOCs) occurs at extraction wells when compared with the effective solubilities of the VOC components (TCE and PCE) in the dense, nonaqueous phase liquid (DNAPL) source zone. This dilution is believed to be due to the convergence of both contaminated and uncontaminated streamtubes on the extraction wells studied. Thus, the measured concentrations of dissolved VOCs in extraction wells appear to be principally functions of (1) the effective solubilities of the DNAPL components, and (2) the dilution due to streamtube convergence on the extraction wells. A simple method for computing DNAPL composition and the dilution factor from extraction well data is presented for the case when dilution is the dominant mechanism that causes the measured ground-water concentrations of dissolved VOC components to be significantly less than their respective effect solubilities relative to the DNAPL mixture. This method successfully computes the molar composition of a PCE/TCE DNAPL, bailed from a pair of monitor wells at the Savannah River Site, using the measured concentrations of PCE and TCE in ground waters from the same pair of wells. The method is then used to predict the variation of DNAPL composition within the aquifer from VOC data sampled at all 11 extraction wells. Such information is of considerable use in choosing solvent-specific surfactants for enhanced remediation operations.

368 Measurement error and spatial variability effects on characterization of volatile organics in the subsurface. West, O.R. (Oak Ridge National Lab., TN (United States)); Siegrist, R.L.; Mitchell, T.J.; Jenkins, R.A. *Environmental Science and Technology*; 29(3): 647-656 (Mar 1995). DOE Contract AC05-84OR21400.

The effects of measurement error and spatial variability on establishing subsurface contaminant distributions were demonstrated in a study described herein, where soil underlying a former land treatment facility was intensively sampled and analyzed for volatile organic compounds (VOCs). Concentrations of VOCs measured on-site using a heated headspace/gas chromatography method were typically 10 times higher than concentrations measured at an off-site laboratory using a purge-and-trap/gas chromatography/mass spectrometry method. This was attributed either to VOC losses during storage and preparation of off-site samples and/or inefficient VOC extraction in the off-site method. Three contaminant distribution models developed from the

on-site VOC measurements were evaluated through cross-validation and subregion sampling methods. Order of magnitude discrepancies existed between predicted and measured concentrations. These results show that increasing sampling density with cost-effective field analyses can be more effective than using complex spatial models to overcome the lack of spatial information in sparse data sets comprised of off-site laboratory analyses. 25 refs., 8 figs., 2 tabs.

369 Sequestration of the tributyl phosphate complex of europium nitrate in the clay hectorite. A ³¹P NMR study. Hartzell, C.J. (Northern Arizona Univ., Flagstaff, AZ (United States)); Yang, S.W.; Parnell, R.A.; Morris, D.E. *Journal of Physical Chemistry (United States)*; 99(12): 4205-4210 (23 Mar 1995).

Application of ³¹P NMR to distinguish Eu(NO₃)₃-complexed tributyl phosphate from uncomplexed tributyl phosphate (TBP) facilitates an understanding of the fate of these species in the clay hectorite. Solution ³¹P NMR studies show dramatic shifts of -156.0 to -172.9 ppm for Eu(NO₃)₃·6H₂O dissolved in TBP at TBP:Eu ratios 1:1 to 1:2.5. Pure TBP exhibits ³¹P chemical shift of -0.3 ppm. Mixtures with higher TBP:Eu ratios display lines progressively downfield of -156.0 ppm, reflecting exchange of complexed and free TBP. The Eu(NO₃)₃-complexed TBP adsorbed into hectorite displays a ³¹P chemical shift of -180.7 to -193.8 ppm. Clays adsorbed with solutions that are 3:1, 5:1 and 7:1 TBP:Eu display peaks due to complex as well as peaks in the range -4 to -6 ppm attributed to uncomplexed TBP. No evidence of exchange is observed. Spectra of the TBP-adsorbed clay give a TBP line at -0.7 ppm which changes slightly to -5.0 after exchange with Eu(NO₃)₃. The Eu(NO₃)₃-exchanged hectorite displays a line at -17.6 ppm after adsorption of TBP. Neither of the latter two samples show indication of complex formation. The hectorite samples exposed to TBP or the complex display (001) d spacings of 17.9-18.4 Å compared to 12.3-12.5 Å for hectorite which has not been exposed to TBP. 26 refs., 5 figs., 3 tabs.

370 Scintillating-glass-fiber neutron sensors. Abel, K.H. (Pacific Northwest Laboratory, Richland, WA 99352 (United States)); Arthur, R.J.; Bliss, M.; Brite, D.W.; Brodzinski, R.L.; Craig, R.A. *Nuclear Instruments and Methods in Physics Research, Section A*; 353(1-3): 114-117 (30 Dec 1994). (CONF-940524-: 8. symposium on radiation measurements and applications, Ann Arbor, MI (United States), 16-19 May 1994).

Cerium-doped lithium-silicate glass fibers have been developed at Pacific Northwest Laboratory (PNL) for use as thermal neutron detectors. By using highly-enriched ⁶Li, these fibers efficiently capture thermal neutrons and produce scintillation light that can be detected at the ends of the fibers. Advantages of scintillating fibers over ³He or BF₃ proportional tubes include flexibility in geometric configuration, ruggedness in high-vibration environments, and less detector weight for the same neutron sensitivity. This paper describes the performance of these scintillating fibers with regard to count rates, pulse height spectra, absolute efficiencies, and neutron/gamma discrimination. Fibers with light transmission lengths (1/e) of greater than 2 m have been produced at PNL. Neutron sensors in fiber form allow development of a variety of neutron detectors packaged in previously unavailable configurations. Brief descriptions of some of the devices already produced are included to illustrate these possibilities. ((orig.))

371 Field pilot test of surfactant-enhanced remediation of trichloroethane DNAPL in a sand aquifer. Jackson, R.E. (INTERA Inc., Austin, TX (United States)); Butler, G.W.; Londergan, J.T.; Mariner, P.E.; Pickens, J.F.; Fountain, J.C.; Davis, K.R.; Douthitt, J.W. *Ground Water (United States)*; 32(5): 852-853 (Sep-Oct 1994). (CONF-9410209-: Ground water remediation: existing technology and future direction, Las Vegas, NV (United States), 9-12 Oct 1994).

The sequence of lacustrine and outwash deposits beneath a vapor degreasing operation at the Paducah Gaseous Division Plant, Kentucky, is contaminated with trichloroethane due to leakage from a sewer/sump line. A plume of dissolved trichloroethane (TCE) extends throughout an area of approximately 3 km² in the Regional Gravel Aquifer (RGA) which is located between 20 and 30 meters below ground surface. It is suspected that some 40,000 liters of TCE might have escaped into the subsurface at Paducah, most of which is still present in the lacustrine deposits and the underlying RGA as DNAPL. A field test to confirm the presence of TCE DNAPL in the sandy, upper portion of the RGA around a monitoring well and to test the efficiency of the surfactant for TCE solubilization is described. The aqueous concentrations of TCE in this well have consistently been measured at 300–550 mg TCE/L over a period of three years. The use of Capillary and Bond numbers to estimate the improbability of mobilization of DNAPL due to the lowering of the interfacial tension is described. The multiphase, multicomponent simulator UTCHEM was used to simulate both the injection and extraction of the surfactant solution and the solubilization of the TCE by the surfactant micelles.

372 Optical spectroscopic studies of the sorption of UO₂²⁺ species on a reference smectite. Morris, D.E. (Los Alamos National Lab., NM (United States)); Conradson, S.G. Chisholm-Brause, C.J.; Barr, M.E.; Eller, P.G. *Geochimica et Cosmochimica Acta (United States)*; 58(17): 3613-3623 (Sep 1994).

The speciation of UO₂²⁺ (uranyl) on a reference smectite (SAz-1 from Cheto, Arizona, USA) has been investigated by electronic emission and Raman vibrational spectroscopies. The spectroscopic studies have been done on uranyl-bearing clays prepared from aqueous solutions of uranyl nitrate in the pH range from ~2.5 to 7 and high initial ionic strength (~0.1-0.3 M). The uranyl loading levels in these samples ranged from ~0.1% to ~53% of the reported cation exchange capacity (~1.2 meq/g). Vibronically resolved emission spectra have been obtained for all samples. These spectra vary significantly in intensity and band-shape as a function of uranyl concentration in the clays and the equilibrium pH of the solutions from which the clays were prepared. For most clay samples the measured emission spectrum is a composite of spectra from multiple uranyl emitters. At the lowest loading levels a uranyl sorption complex with an apparent vibronic spacing of ~750 cm⁻¹ dominates the spectra. At intermediate loading levels an additional uranyl sorption complex also having an apparent vibronic spacing of ~750 cm⁻¹ is present at an approximately constant concentration ratio to the species in the most dilute samples. At the highest loading levels, a uranyl sorption complex with a vibronic spacing of ~850 cm⁻¹ dominates the spectra. Raman spectra have been obtained for the more concentrated uranyl/clay samples. Two distinct bands (855 cm⁻¹ and 883 cm⁻¹) are seen in the spectral region of the totally symmetric uranyl stretch. The 855 cm⁻¹ band correlates with the

dominant high-coverage species, while the 883 cm⁻¹ band arises from an additional sorption complex.

373 Speciation of uranyl sorbed at multiple binding sites on montmorillonite. Chisholm-Brause, C. (Los Alamos National Lab., NM (United States)); Buscher, C.T.; Eller, P.G.; Morris, D.E.; Conradson, S.D. *Geochimica et Cosmochimica Acta (United States)*; 58(17): 3615-3621 (Sep 1994).

The authors have investigated the structures of U(VI) complexes as uranyl moieties sorbed onto a reference montmorillonite, SAz-1, using X-ray absorption fine structure spectroscopy (XAFS). The uranyl-loaded clays were prepared from aqueous solutions of uranyl nitrate in the pH range from 3.0 to 3.5. The U concentrations on the clay ranged from 1.7 to 34.6% of the reported cation exchange capacity (CEC = 1.2 meq/g) of the clay. For all samples, XAFS results indicate that there are two axial oxygen atoms at 1.78-1.80 Å, as expected for the uranyl moiety. The average numbers and distances of equatorial oxygen atoms about uranyl sorbed on the clay vary significantly as a function of surface coverage. At high coverage (34.6% CEC), the average number and distance of equatorial oxygen atoms are near those found for the fully hydrated uranyl species in aqueous solution. However, there are fewer equatorial oxygen atoms at a shorter average distance about uranyl sorbed at low coverage (1.7% CEC). At moderate coverage (7.3% CEC), the average number and distance of equatorial oxygen atoms are intermediate between those at higher and lower coverage. These changes suggest that sorbing U is reacting with at least three different sites on the clay as U concentration increases. The existence of multiple surface sites and sorption complexes which are structurally distinct from solution species need to be considered for rigorous modeling of sorption processes.

374 A batch reactor for monitoring process dynamics during biodegradation of volatile organics. Skøen, R.S. (Pacific Northwest Lab., Richland, WA (United States)); Truex, M.J.; Petersen, J.N.; Hill, J.S. *Environmental Progress (United States)*; 13(3): 174-177 (Aug 1994). DOE Contract FG06-89ER75522 ; AC06-76RL01830.

Data are presented that demonstrate a batch reactor that allows accurate monitoring of process dynamics during biodegradation of volatile organics. Using this system, many samples can be removed in an aseptic fashion, allowing frequent measurements of the concentrations of biomass, electron donors, electron acceptors, and volatile compounds. Additionally, the reactor is well instrumented, allowing the continuous monitoring of pH, oxidation/reduction potential, pressure, and temperature. The reactor is constructed entirely of materials which have minimal interaction with volatile organic compounds. It is also demonstrated that sample removal does not cause losses of volatile compounds since the sampling ports are double sealed, making use of both gas-tight stainless steel ball valves and Teflon-lined septa.

375 Characteristic-Galerkin methods for contaminant transport with nonequilibrium adsorption kinetics. Dawson, C.N. (Rice Univ., Houston, TX (United States). Dept. of Computational and Applied Mathematics); Wheeler, M.F.; Van Duijn, C.J. *SIAM Journal on Numerical Analysis (Society for Industrial and Applied Mathematics) (United States)*; 31(4): 982-999 (Aug 1994).

A procedure based on combining the method of characteristics with a Galerkin finite element method is analyzed

for approximating reactive transport in groundwater. In particular, equations modeling contaminant transport with nonlinear, nonequilibrium adsorption reactions are considered. This phenomenon gives rise to non-Lipschitz but monotone nonlinearities which complicate the analysis. A physical and mathematical description of the problem under consideration is given, then the numerical method is described and a priori error estimates are derived.

376 The role of vegetation in barriers and the prediction of soil water dynamics. Link, S.O. (Pacific Northwest Laboratory, Richland, WA (United States)); Kickert, R.N.; Fayer, M.J.; Gee, G.W. *Bulletin of the Ecological Society of America (United States)*; 75(2): 133 (Jun 1994). DOE Contract AC06-76RL01830. (CONF-940894-- Annual Ecological Society of America (ESA) meeting: science and public policy, Knoxville, TN (United States), 7-11 Aug 1994).

The Hanford Barrier Program was developed to design an earthen cover system to inhibit water infiltration, plant and animal intrusion, and wind and water erosion. Plants have a significant role in barrier function. Lysimeter studies indicate that a surface layer of fine soil with deep-rooted plants precludes drainage even with three times normal precipitation. Two simulation models, Soil Water Infiltration and Movement (SWIM) and Simulation of Production and Utilization of Rangelands (SPUR-91) were compared for their ability to predict soil water storage dynamics with and without plants in weighing lysimeters: These models adequately predicted soil water storage dynamics for the weighing lysimeters. The range of room mean square error values for the two models was 7.0 to 19.8.

377 Field comparison of micropurging vs. traditional ground water sampling. Kearl, P.M.; Korte, N.E.; Stites, M.; Baker, J. *Ground Water Monitoring and Remediation (United States)*; 14(4): 183-190 (Fall 1994).

Micropurge sampling of ground water wells has been suggested as a possible replacement to traditional purge and sample methods. To compare methods, duplicate ground water samples were collected at two field sites using traditional and micropurge methods. Samples were analyzed for selected organic and inorganic constituents, and the results were compared statistically. Analysis of the data using the nonparametric sign test indicates that within a 95% confidence interval, there was no significant difference between the two methods for the site contaminants and the majority of analytes. These analytical results were supported by visual observations with the colloidal borescope, which demonstrated impacts on the flow system in the well when using traditional sampling methods. Under selected circumstances, the results suggest replacing traditional sampling with micropurging based on reliability, cost, and waste minimization.

378 A preliminary investigation of the existence of radiocolloids in leachate from the NRC field lysimeter investigations. Brey, R.R. (Idaho State Univ., Pocatello, ID (United States). Dept. of Physics); McConnell, J.W.; Rogers, R.D.; Sullivan, T.M.; Jastrow, J.D. *Waste Management (United States)*; 14(7): 581-588 (1994). DOE Contract AC07-76ID01570.

Leachate samples collected from sand and soil-filled lysimeters (of the Field Lysimeter Investigation: Low-Level Waste Data Base Development Program) were examined to determine if radiocolloid particles were present. Radiometric analyses were performed on 1.0 l volumes of leachate.

Samples of these leachates were passed through polycarbonate filters with pore diameters from 0.01 μm to 0.40 μm . One set of filters was analyzed to determine if radioactive material was trapped on their surfaces. A second set of filters was analyzed with a scanning electron microscope and energy dispersive x-ray analysis. Three radionuclides, Sr-90, Cs-137, and Co-60, were measured at 33.7 ± 0.52 , 0.20 ± 0.03 , and 0.13 ± 0.03 Bq/L, respectively, in the sand filled lysimeter leachate. Only Sr-90 at a concentration of 8.58 ± 0.37 Bq/l was measured in the soil filled lysimeter leachate. Amorphous particles, 0.20 μm in diameter were observed on the filters used with the sand filled lysimeter leachate. X-ray dispersive analysis was used to quantify the fractions of high atomic number materials present in these particles. Although stoichiometrically appropriate quantities of oxygen and perhaps carbon are also present, x-ray dispersive analysis indicated that these particles were composed of Si (9%), Ca (87%), and Mg (4%). Amorphous particles ≤ 0.20 μm in diameter composed primarily of Si, and spherical particles about 0.2 μm in diameter composed of low atomic number material, were observed on the filters used with the soil filled lysimeter leachate. Beta radiation emitting radioactive material was detected on the filters. The relative activity of beta emitting radionuclides detected on the filters was observed to increase as filter pore sizes decreased. This observation provides evidence of the presence of radiocolloids. It also indicates that a minor radiocolloid transport mechanism may be occurring within these lysimeters.

379 Bioluminescent reporter bacteria detect contaminants in soil samples. Burlage, R.S. (Oak Ridge National Lab., TN (United States)); Palumbo, A.V.; Heitzer, A.; Sayler, G. *Applied Biochemistry and Biotechnology (United States)*; 45-46: 731-740 (Spr 1994). DOE Contract AC05-84OR21400.

Reporter strains of bacteria were tested using soil samples from several sites near a leaking fuel oil storage facility. The reporter bacteria utilized the bioluminescent lux genes from *Vibrio fischeri*, which were transcriptionally fused to catabolic gene sequences. The catabolic genes of interest specified the degradation of toluene (from the TOL plasmid) and naphthalene (from the NAH7 plasmid and from a NAH plasmid recently isolated). The results indicated that two soil samples were contaminated with both toluene (or xylene) and naphthalene. These data were useful in describing the extent of contamination at the site. 9 refs., 5 figs., 1 tab.

380 The effect of media composition on EDTA degradation by *Agrobacterium* sp. Palumbo, A.V. (Oak Ridge National Lab., TN (United States)); Lee, S.Y.; Boerman, P. *Applied Biochemistry and Biotechnology (United States)*; 45-46: 811-822 (Spr 1994). DOE Contract AC05-84OR21400.

EDTA degradation by an *Agrobacterium* sp. has been examined by quantifying ^{14}C -labeled CO_2 produced from iron-[2- ^{14}C] EDTA and by measured loss of nonlabeled EDTA by HPLC. Fe-EDTA degradation resulted in a rise in pH, nitrate concentration, and ammonia concentration. Addition of glycerol resulted in suppression of Fe-EDTA degradation and in a decrease in pH and NH_4^+ concentration in the media. Addition of peptone or yeast extract did not affect degradation. Some of the components (e.g., biotin) of the media are not necessary for growth and biodegradation. Although cobalt-EDTA cannot be degraded, ferrous iron can be added to displace the cobalt. The purpose was to relate the results to remediation of radionuclide-contaminated soils. 12 refs., 4 figs., 2 tabs.

381 Potential for microbial growth in arid subsurface sediments. Palumbo, A.V. (Oak Ridge National Lab., TN (United States)); McCarthy, J.F.; Pfiffner, S.; Phelps, T.J.; Parker, A.; Colwell, F.S. *Applied Biochemistry and Biotechnology (United States)*; 45-46: 823-834 (Spr 1994). DOE Contract AC05-84OR21400.

To determine if bacterial populations could be increased for bioremediation of contaminants, the microbial growth arising in 200 h from the solid material from the vadose zone at an arid site after addition of water and nutrients was determined. Initial bacterial populations and activities at the site were very low. Bacteria grew in the interbed sands and silts with the higher carbon contents (0.08-1.1%), but did not respond in the basalts and interbed material with lower carbon content (undetectable). In longer term studies, to 30 d, there was evidence for bacterial activity in less than 25% of either the basalts or interbed material. 22 refs., 4 figs., 1 tab.

382 Chemical barriers for controlling groundwater contamination. Morrison, S.J. (Environmental Sciences Lab., Grand Junction, CO (United States)); Spangler, R.R. *Environmental Progress (United States)*; 12(3): 175-181 (Aug 1993). DOE Contract AC04-86ID12584.

Chemical barriers are being explored as a low-cost means of controlling groundwater contamination. The barrier can intercept a contaminant plume and prevent migration by transferring contaminants from the groundwater to immobile solids. A chemical barrier can be emplaced in a landfill liner or in an aquifer cutoff wall or can be injected into a contaminant plume. Chemical barriers can be classified as either precipitation barriers or sorption barriers depending upon the dominant mode of contaminant extraction. In a precipitation barrier, contaminants are bound in the structures of newly formed phases; whereas, in a sorption barrier, contaminants attach to the surfaces of preexisting solids by adsorption or some other surface mechanism. Sorption of contaminants is pH dependent. A precipitation barrier can control the pH of the system, but alkaline groundwater may dominate the pH in a sorption barrier. A comparison is made of the characteristics of precipitation and sorption barriers. Experimental data on the extraction of uranium and molybdenum from simulated groundwater are used to demonstrate these concepts. 10 refs., 9 figs., 1 tab.

383 Biodegradation of chlorinated aliphatics and aromatic compounds in total-recycle expanded-bed biofilm reactors. Korde, V.M. (Univ. of Tennessee, Knoxville, TN (United States)); Bienkowski, P.R.; Phelps, T.J.; White, D.C. *Applied Biochemistry and Biotechnology (United States)*; 39-40: 631-641 (Spr 1993).

Ground-water contamination by chlorinated aliphatic compounds is a major cause for concern because of their toxicity. This study examined the biodegradation of trichloroethylene and aromatic compounds by microbial consortia enriched from contaminated subsurface sediments. The consortia were capable of utilizing methane and propane as sources of carbon and energy. Two continuously recycled expanded-bed bioreactors were inoculated with (1) the subsurface consortium, and (2) *P. fluorescens*, *P. putida* (strains pRB1401 and pWWO), and *M. trichosporium* OB3b. An uninoculated reactor containing 0.2% sodium azide and 0.5% formalin served as the control. Methane (5% v/v) and propane (3% v/v) were maintained by batch feeding through the course of the experiment. Greater than 97% degradation of trichloroethylene was observed over a period of 12 d. More than 99% of benzene, toluene, and xylene were degraded within the first 7 d. Dissolved oxygen

levels were measured and found to be in the range 4.9-6.5 mg/L throughout the experiments. 23 refs., 4 figs., 2 tabs.

384 Use of a mathematical model for prediction of optimum feeding strategies for in situ bioremediation. Shouche, M. (Washington State Univ., Pullman, WA (United States)); Petersen, J.N.; Skeen, R.S. *Applied Biochemistry and Biotechnology (United States)*; 39-40: 763-779 (Spr 1993). DOE Contract AC06-76RL01830.

Liquid wastes containing radioactive, hazardous, and regulated chemicals have been generated throughout the 40+ years of operations at the US Department of Energy (DOE) Hanford site. Some of these wastes were discharged to the soil column, and many of the waste components, including nitrate, carbon tetrachloride (CCl₄), and several radionuclides, have been detected in the Hanford ground water. Current DOE policy prohibits the disposal of the contaminated liquids directly to the environment, and remediation of the existing contaminated ground waters may be required. In situ bioremediation is one technology currently being developed at Hanford to meet the need for cost-effective technologies to clean ground water contaminated with CCl₄, nitrate, and other organic and inorganic contaminants. This article focuses on the latest results of an ongoing effort to develop effective in situ remediation strategies through the use of predictive simulations. In particular, strategies for nutrient injection are developed that minimize biomass accumulation within the flow field and thus extend the life of injection wells. 18 refs., 8 figs., 1 tab.

385 Inadequacy of commonly used risk assessment guidance for determining whether solvent-contaminated soils can affect groundwater at arid sites. Korte, N.E. (Oak Ridge National Lab., Grand Junction, CO (United States)); Kearn, P.M.; Gleason, T.A.; Beale, J.S. *Journal of Environmental Science and Health, Part A: Environmental Science and Engineering (United States)*; 27(8): 2251-2261 (Dec 1992). DOE Contract AC05-84OR21400.

Commonly used risk assessment guidance is not adequate when applied to solvent-contaminated soils in arid environments. The equations that are recommended for calculating how such soils will affect groundwater assume that liquid phase leaching controls contaminant migration. If vapor phase migration is considered at all, diffusion is assumed to be the dominant process. In contrast, a field study performed at an industrial site in Southern California demonstrated that leaching could not account for the transport of contaminants to the water table and the recent technical literature suggests that gravity-induced vapor migration may be the principal mechanism for vapor phase migration. Thus, regulatory guidance provided by the United States Environmental Protection Agency and the State of California could result in a significant underestimate of the amount of chlorinated solvent that could contaminate the groundwater at arid sites. 14 refs., 2 figs.

386 Bioremediation of contaminated groundwater. Hazen, T.C.; Fliermans, C.B. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,384,048/A. 24 Jan 1995. Filed date 8 Mar 1994. U.S. Patent Application 8-207,506. Int. Cl. C02F 3/30. [10p.] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An apparatus and method are described for in situ remediation of contaminated subsurface soil or groundwater contaminated by chlorinated hydrocarbons. A nutrient fluid is

selected to stimulate the growth and reproduction of indigenous subsurface microorganisms that are capable of degrading the contaminants. An oxygenated fluid is selected to create a generally aerobic environment for these microorganisms to degrade the contaminants, leaving only pockets that are anaerobic. The nutrient fluid is injected periodically while the oxygenated fluid is injected continuously and both are extracted so that both are drawn across the plume. The nutrient fluid stimulates microbial colony growth. Withholding it periodically forces the larger, healthy colony of microbes to degrade the contaminants. Treatment is continued until the subsurface concentration of contaminants is reduced to an acceptable, preselected level. The nutrient fluid can be methane and the oxygenated fluid air for stimulating production of methanotrophs to break down chlorohydrocarbons, especially trichloroethylene (TCE) and tetrachloroethylene. 3 figures.

387 Containment of subsurface contaminants. Corey, J.C. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,345,034/A. 6 Sep 1994. Filed date 3 Feb 1993. U.S. Patent Application 8-012,864. Int. Cl. B09B 3/00; E02D 3/00. [10p.] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A barrier is disclosed for reducing the spread of a plume of subsurface contaminants. The apparatus includes a well system for injecting a fluid, such as air, just outside and below the periphery of the plume. The fluid is injected at a pressure sufficient to lower the hydraulic conductivity of the soil from the point of injection to the surface thus establishing a curtain-like barrier to groundwater movement. The barrier is established upgradient of the plume to divert groundwater away, or preferably completely around the plume to reduce the flow of groundwater into or out of the plume. The barrier enables the remediation of the confined contamination and then, when the injection of the fluid is halted, the barrier quickly dissipates. 5 figs.

388 Monitoring probe for groundwater flow. Looney, B.B.; Ballard, S. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,339,694/A. 23 Aug 1994. Filed date 25 May 1993. U.S. Patent Application 8-066,236. Int. Cl. G01F 1/56. [10p.] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A monitoring probe for detecting groundwater migration is disclosed. The monitor features a cylinder made of a permeable membrane carrying an array of electrical conductivity sensors on its outer surface. The cylinder is filled with a fluid that has a conductivity different than the groundwater. The probe is placed in the ground at an area of interest to be monitored. The fluid, typically saltwater, diffuses through the permeable membrane into the groundwater. The flow of groundwater passing around the permeable membrane walls of the cylinder carries the conductive fluid in the same general direction and distorts the conductivity field measured by the sensors. The degree of distortion from top to bottom and around the probe is precisely related to the vertical and horizontal flow rates, respectively. The electrical conductivities measured by the sensors about the outer surface of the probe are analyzed to determine the rate and direction of the groundwater flow. 4 figs.

389 Optimal joule heating of the subsurface. Berryman, J.G.; Daily, W.D. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,325,918/A. 5 Jul 1994. Filed

date 2 Aug 1993. U.S. Patent Application 8-100,800. Int. Cl. E21B 36/04; E21B 43/22; E21B 43/24; G01V 3/04. [10p.] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A method for simultaneously heating the subsurface and imaging the effects of the heating is disclosed. This method combines the use of tomographic imaging (electrical resistance tomography or ERT) to image electrical resistivity distribution underground, with joule heating by electrical currents injected in the ground. A potential distribution is established on a series of buried electrodes resulting in energy deposition underground which is a function of the resistivity and injection current density. Measurement of the voltages and currents also permits a tomographic reconstruction of the resistivity distribution. Using this tomographic information, the current injection pattern on the driving electrodes can be adjusted to change the current density distribution and thus optimize the heating. As the heating changes conditions, the applied current pattern can be repeatedly adjusted (based on updated resistivity tomographs) to affect real time control of the heating.

390 Method of degrading pollutants in soil. Hazen, T.C.; Lopez-De-Victoria, G. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,326,703/A. 5 Jul 1994. Filed date 10 Jun 1992. U.S. Patent Application 7-896,762. Int. Cl. C12N 1/38; C12N 1/30; C12N 1/12. [10p.] DOE Contract AC09-76SR00001. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

Disclosed are a method and system for enhancing the motility of microorganisms. This is accomplished by placing an effective amount of chlorinated hydrocarbons, preferably chlorinated alkenes, and most preferably trichloroethylene in spaced relation to the microbes so that the surprisingly strong, monomodal, chemotactic response of the chlorinated hydrocarbon on subsurface microbes can draw the microbes away from or towards and into a substance, as desired. In remediation of groundwater pollution, for example, TCE can be injected into the plume to increase the population of microbes at the plume whereby the plume can be more quickly degraded. A TCE-degrading microbe, such as *Welchia alkenophila*, can be used to degrade the TCE following the degradation of the original pollutant. 5 figures.

391 Heating of solid earthen material, measuring moisture and resistivity. Heath, W.O.; Richardson, R.L.; Goheen, S.C. To Battelle Memorial Inst., Richland, WA (United States). U.S. Patent 5,330,291/A. 19 Jul 1994. Filed date 13 May 1992. Int. Cl. E02D 3/11; B09B 3/00. [10p.] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The present invention includes a method of treating solid earthen material having volatile, semi-volatile, and non-volatile contaminants. Six electrodes are inserted into a region of earthen material to be treated in a substantially equilateral hexagonal arrangement. Six phases of voltages are applied to corresponding electrodes. The voltages are adjusted within a first range of voltages to create multiple current paths between pairs of the electrodes. The current paths are evenly distributed throughout the region defined by the electrodes and therefore uniformly heat the region. The region of earthen material is heated to a temperature sufficient to substantially remove volatile and semi-volatile contaminants by promoting microbial action. This temperature is less than a melting temperature of the earthen material. 13 figs.

392 Enhanced photo-activated luminescence for screening polychlorobiphenyls (PCBs) and other related chlorinated compounds. Vo-Dinh, T. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). U.S. Patent 5,318,751/A. 7 Jun 1994. Filed date 20 Aug 1993. U.S. Patent Application 8-109,759. Int. Cl. G01N 33/18; G01N 21/64. [10p.] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The presence of polychlorinated biphenyls and other chlorinated compounds in a sample is determined by treating the sample with a photo-activator and then exposing the treated sample to a UV light source. The UV light produces a photo-product complex, which is subsequently excited with UV light to cause luminescence of the complex. The luminescence is detected and characteristics of the luminescence spectra are used to determine the presence of chlorinated compounds and also the quantity of the chlorine in the compounds. 14 figs.

393 Chemotactic selection of pollutant degrading soil bacteria. Hazen, T.C. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,324,661/A. 28 Jun 1994. Filed date 4 Mar 1991. Int. Cl. C12Q 1/04; C12Q 1/00; C12R 1/01. [10p.] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A method is described for identifying soil microbial strains which may be bacterial degraders of pollutants comprising the steps of placing a concentration of a pollutant in a substantially closed container, placing the container in a sample of soil for a period of time ranging from one minute to several hours, retrieving the container, collecting the contents of the container, and microscopically determining the identity of the bacteria present. Different concentrations of the pollutant can be used to determine which bacteria respond to each concentration. The method can be used for characterizing a polluted site or for looking for naturally occurring biological degraders of the pollutant. Then bacteria identified as degraders of the pollutant and as chemotactically attracted to the pollutant are used to inoculate contaminated soil. To enhance the effect of the bacteria on the pollutant, nutrients are cyclicly provided to the bacteria then withheld to alternately build up the size of the bacterial colony or community and then allow it to degrade the pollutant. 6 figures.

394 In-situ remediation system and method for contaminated groundwater. Corey, J.C.; Looney, B.B.; Kaback, D.S. To Dept. of Energy, Washington, DC (United States). U.S. Patent 4,832,122/A. 23 May 1989. Filed date 25 Aug 1988. Int. Cl. E21B 36/00; E21B 43/00; E21B 43/40. [10p.] DOE Contract AC09-76SR00001. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A system for removing volatile contaminants from a subsurface plume of contamination comprising two sets of wells, a well for injecting a fluid into a saturated zone on one side of the plume and an extracting well for collecting the fluid together with volatilized contaminants from the plume on the other side of the plume. The fluid enables the volatile contaminants to be volatilized and carried therewith through the ground to the extracting well. Injecting and extracting wells are preferably horizontal wells positioned below the plume in the saturated zone and above the plume in the vadose zone, respectively. The fluid may be air or other gas or a gas and liquid mixture depending on the type of contaminant to be removed and may be preheated to facilitate volatilization.

Treatment of the volatilized contamination may be by filtration, incineration, atmospheric dispersion or the like. 3 figs.

MIXED WASTE CHARACTERIZATION, TREATMENT, AND DISPOSAL

Refer also to citation(s) 1, 2, 3, 17, 18, 21, 36, 193, 1836, 2098

395 (ANL-94/38) Analytical electron microscopy characterization of uranium-contaminated soils from the Fernald Site, FY1993 report. Buck, E.C.; Cunnane, J.C.; Brown, N.R.; Dietz, N.L. Argonne National Lab., IL (United States). Oct 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95006155. Source: OSTI; NTIS; INIS; GPO Dep.

A combination of optical microscopy, scanning electron microscopy with backscattered electron detection (SEM/BSE), and analytical electron microscopy (AEM) is being used to determine the nature of uranium in soils from the Fernald Environmental Management Project. The information gained from these studies is being used to develop and test remediation technologies. Investigations using SEM have shown that uranium is contained within particles that are typically 1 to 100 μm in diameter. Further analysis with AEM has shown that these uranium-rich regions are made up of discrete uranium-bearing phases. The distribution of these uranium phases was found to be inhomogeneous at the microscopic level.

396 (ANL-94/45) Sludge technology assessment. Krause, T.R.; Cunnane, J.C.; Helt, J.E. Argonne National Lab., IL (United States). Dec 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95011487. Source: OSTI; NTIS; INIS; GPO Dep.

The retrieval, processing, and generation of final waste forms from radioactive tank waste sludges present some of the most challenging technical problems confronting scientists and engineers responsible for the waste management programs at the various Department of Energy laboratories and production facilities. Currently, the Department of Energy is developing a strategy to retrieve, process, and generate a final waste form for the sludge that meets the acceptance criteria for the final disposition. An integral part of this strategy will be use of separation processes that treat the sludge; the goal is to meet feed criteria for the various processes that will generate the final waste form, such as vitrification or grouting. This document is intended to (1) identify separation technologies which are being considered for sludge treatment at various DOE sites, (2) define the current state of sludge treatment technology, (3) identify what research and development is required, (4) identify current research programs within either DOE or academia developing sludge treatment technology, and (5) identify commercial separation technologies which may be applicable. Due to the limited scope of this document, technical evaluations regarding the need for a particular separations technology, the current state of development, or the research required for implementation, are not provided.

397 (ANL/CMT/CP-82121) Minimum additive waste stabilization (MAWS). Beskid, N. (Argonne National Lab., IL (United States)); Mazer, J.; Gimpel, R.; Warner, R. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract W-31109-ENG-38. (CONF-940853-5: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94017078. Source: OSTI; NTIS; INIS; GPO Dep.

Low-level radioactive and mixed waste remediation is a major concern at US Department of Energy (DOE) sites across the country. The objective of the Minimum Additive Waste Stabilization (MAWS) Program is to demonstrate a synergistic combination of technologies that makes treatment by vitrification an economical alternative to cementation for some types of low-level radioactive and mixed waste. Information and expertise gained from the MAWS demonstration will be useful to all other DOE sites considering vitrification as a waste treatment alternative. This program is providing information that shows how vitrification will work as a treatment for low-level radioactive wastes and mixed wastes and how it may be integrated with other treatment technologies before vitrification can be recommended as a treatment method for multimillion dollar remediation projects. A cost analysis illustrated how millions of dollars could be saved in the remediation efforts at the Fernald Environmental Management Project (FEMP) located near Cincinnati, Ohio. If the MAWS demonstration is successful, the technology may be adapted for further use in the DOE complex.

398 (ANL/CMT/CP-82692) Removal of CO₂ in closed loop off-gas treatment systems. Clemens, M.K.; Nelson, P.A.; Swift, W.M. Argonne National Lab., IL (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409215-1: 6. Emerging technologies in hazardous waste management, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE94019259. Source: OSTI; NTIS; INIS; GPO Dep.

A closed loop test system has been installed at Argonne National Laboratory (ANL) to demonstrate off-gas treatment, absorption, and purification systems to be used for incineration and vitrification of hazardous and mixed waste. Closed loop systems can virtually eliminate the potential for release of hazardous or toxic materials to the atmosphere during both normal and upset conditions. In initial tests, a 250,000 Btu/h (75 kW thermal) combustor was operated in an open loop to produce a combustion product gas. The CO₂ in these tests was removed by reaction with a fluidized bed of lime to produce CaCO₃. Subsequently, recirculation system was installed to allow closed loop operation with the addition of oxygen to the recycle stream to support combustion. Commercially marketed technologies for removal of CO₂ can be adapted for use on closed loop incineration systems. The paper also describes the Absorbent Solution Treatment (AST) process, based on modifications to commercially demonstrated gas purification technologies. In this process, a side loop system is added to the main loop for removing CO₂ in scrubbing towers using aqueous-based CO₂ absorbents. The remaining gas is returned to the incinerator with oxygen addition. The absorbent is regenerated by driving off the CO₂ and water vapor, which are released to the atmosphere. Contaminants are either recycled for further treatment or form precipitates which are removed during the purification and regeneration process. There are no direct releases of gases or particulates to the environment. The CO₂ and water vapor go through two changes of state before release, effectively separating these combustion products from contaminants released during incineration. The AST process can accept a wide range of waste streams. The system may be retrofitted to existing facilities or included in the designs for new installations.

399 (ANL/CMT/CP-83588) Removal of actinide elements from liquid scintillation cocktail wastes using liquid-liquid extraction and demulsification techniques. Foltz, K. (Univ. of Illinois, Urbana, IL (United States)); Landsberger, S.; Srinivasan, B.; Vandegrift, G.F. Argonne National Lab., IL (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941102-41: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95009897. Source: OSTI; NTIS; INIS; GPO Dep.

For many years liquid scintillation cocktail (LSC) wastes have been generated and stored at Argonne National Laboratory (ANL). These wastes are stored in thousands of 10-20 ml scintillation vials, many of which contain elements with $Z > 88$. Because storage space is limited, disposal of this waste is pressing. These wastes could be commercially incinerated if the radionuclides with $Z > 88$ are reduced to sufficiently low levels. However, there is currently no deminimus level for these radionuclides, and separation techniques are still being tested. The University of Illinois is conducting experiments to separate radionuclides with $Z > 88$ from simulated LSC wastes by using liquid-liquid extraction (LLX) and demulsification techniques. The actinide elements are removed from the LSC by extraction into an aqueous phase after the cocktail has been demulsified. The aqueous and organic phases are separated and the organic phase, now free from radionuclides with $Z > 88$, can be sent to a commercial incineration facility. The aqueous phase may be treated and disposed of using existing techniques. The LLX separation techniques used solutions of sodium oxalate, aluminum nitrate, and tetrasodium EDTA at varying concentrations. These extractants were mixed with the simulated waste in a 1:1 volume ratio. Using 1.0M Na₄ EDTA salt solutions, decontamination ratios as high as 230 were achieved.

400 (ANL/CMT/CP-84751) Microscopic characterization of radionuclide contaminated soils to assist remediation efforts. Buck, E.C.; Brown, N.R.; Dietz, N.L.; Fortner, J.A.; Bates, J.K. Argonne National Lab., IL (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409215-4: 6. Emerging technologies in hazardous waste management, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95002912. Source: OSTI; NTIS; INIS; GPO Dep.

A combination of optical, scanning, and analytical electron microscopies have been used to describe the nature of radionuclide contamination at several sites. These investigations were conducted to provide information for remediation efforts. This technique has been used successfully with uranium-contaminated soils from Fernald, OH, and Portsmouth, OH, thorium-contaminated soil from a plant in Tennessee, plutonium-contamination sand from Johnston Island in the Pacific Ocean, and incinerator ash from Los Alamos, NM. Selecting the most suitable method for cleaning a particular site is difficult if the nature of the contamination is not understood. Microscopic characterization allows the most appropriate method to be selected for removing the contamination and can show the effect a particular method is having on the soil. A method of sample preparation has been developed that allows direct comparison of scanning electron microscopy (SEM) and transmission electron microscopy (TEM) images, enabling characterization of TEM samples to be more representative of the bulk sample.

401 (ANL/CMT/CP-85758) **Characterization of uranium- and plutonium-contaminated soils by electron microscopy.** Buck, E.C. (Argonne National Lab., IL (United States)); Dietz, N.L.; Fortner, J.A.; Bates, J.K.; Brown, N.R. Argonne National Lab., IL (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-65: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008276. Source: OSTI; NTIS; INIS; GPO Dep.

Electron beam techniques have been used to characterize uranium-contaminated soils from the Fernald Site in Ohio, and also plutonium-bearing 'hot particles, from Johnston Island in the Pacific Ocean. By examining Fernald samples that had undergone chemical leaching it was possible to observe the effect the treatment had on specific uranium-bearing phases. The technique of Heap leaching, using carbonate solution, was found to be the most successful in removing uranium from Fernald soils, the Heap process allows aeration, which facilitates the oxidation of uraninite. However, another refractory uranium(IV) phase, uranium metaphosphate, was not removed or affected by any soil-washing process. Examination of "hot particles" from Johnston Island revealed that plutonium and uranium were present in 50-200 nm particles, both amorphous and crystalline, within a partially amorphous aluminum oxide matrix. The aluminum oxide is believed to have undergone a crystalline-to-amorphous transition caused by alpha-particle bombardment during the decay of the plutonium.

402 (ANL/CMT/CP-85759) **An evaluation of glass-crystal composites for the disposal of nuclear and hazardous waste materials.** Wronkiewicz, D.J. (Argonne National Lab., IL (United States)); DiSanto, T.; Wolf, S.F.; Buck, E.C.; Dietz, N.L.; Feng, X. Argonne National Lab., IL (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-66: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008274. Source: OSTI; NTIS; INIS; GPO Dep.

Waste forms made of a glass-crystal composite (GCC) are being evaluated at Argonne National Laboratory for their potential use in the disposal of low-level nuclear and hazardous waste materials. This waste form is being developed within the framework strategy of DOE's minimum Additive Waste Stabilization (MAWS) Program. The MAWS protocol involves the blending of multiple waste streams to achieve an optimal feed composition, which eliminates the need to use large amounts of additives to produce an acceptable waste form. The GCCs have a particularly useful utility in their ability to incorporate waste streams with high metal contents, including those that contain large amounts of scrap metals, and in their potential for sequestering radionuclide and hazardous constituents in corrosion-resistant mineral phases. This paper reports the results from tests conducted with simulated feeds representative of potential DOE and industry waste streams. Topics addressed include the partitioning of various radioactive and hazardous constituents between the glass and crystalline portions of the waste form, the development of secondary phases on the altered sample surfaces during corrosion testing, and the fate of waste components during corrosion testing, as indicated by elements released to solution and microanalysis of the reacted solid samples.

403 (ANL/CMT/PP-82412) **Uranium-contaminated soils: Ultramicrotomy and electron beam analysis.** Buck,

E.C.; Dietz, N.L.; Bates, J.K.; Cunnane, J.C. Argonne National Lab., IL (United States). Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95004644. Source: OSTI; NTIS; INIS; GPO Dep.

Uranium-contaminated soils from the U.S. Department of Energy (DOE) Fernald Site, Ohio, have been examined by a combination of scanning electron microscopy with backscattered electron imaging (SEM/BSE) and analytical electron microscopy (AEM). The inhomogeneous distribution of particulate uranium phases in the soil required the development of a method for using ultramicrotomy to prepare transmission electron microscopy (TEM) thin sections of the SEM mounts. A water-miscible resin was selected that allowed comparison between SEM and TEM images, permitting representative sampling of the soil. Uranium was found in iron oxides, silicates (soddyite), phosphates (autunites), and fluorite (UO₂). No uranium was detected in association with phyllosilicates in the soil.

404 (ANL/DIS/TM-23) **Unit costs of waste management operations.** Kisieleski, W.E.; Folga, S.M.; Gillette, J.L.; Buehring, W.A. Argonne National Lab., IL (United States). Apr 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95008919. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides estimates of generic costs for the management, disposal, and surveillance of various waste types, from the time they are generated to the end of their institutional control. Costs include monitoring and surveillance costs required after waste disposal. Available data on costs for the treatment, storage, disposal, and transportation of spent nuclear fuel and high-level radioactive, low-level radioactive, transuranic radioactive, hazardous, mixed (low-level radioactive plus hazardous), and sanitary wastes are presented. The costs cover all major elements that contribute to the total system life-cycle (i.e., "cradle to grave") cost for each waste type. This total cost is the sum of fixed and variable cost components. Variable costs are affected by operating rates and throughput capacities and vary in direct proportion to changes in the level of activity. Fixed costs remain constant regardless of changes in the amount of waste, operating rates, or throughput capacities. Key factors that influence cost, such as the size and throughput capacity of facilities, are identified. In many cases, ranges of values for the key variables are presented. For some waste types, the planned or estimated costs for storage and disposal, projected to the year 2000, are presented as graphics.

405 (ANL/EA/CP-81120) **Tracking mixed waste from environmental restoration through waste management for the Federal Facility Compliance Act.** Isbell, D. (United States Department of Energy, Germantown, MD (United States)); Tolbert-Smith, M.; MacDonell, M.; Peterson, J. Argonne National Lab., IL (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225-56: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007689. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Compliance Act required the US Department of Energy (DOE) to prepare an inventory report that presents comprehensive information on mixed wastes. Additional documents, such as site treatment plans, were also required of facilities with mixed waste. For a number of reasons, not all DOE mixed waste sites are able to provide

detailed characterization and planning data at this time. Thus, an effort is currently under way to develop a reporting format that will permit mixed waste information across the DOE complex to be tracked as it becomes available.

406 (ANL/EA/CP-82126) Estimation of the effective distribution coefficient from the solubility constant. Wang, Yug-Yea; Yu, C. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-60: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015037. Source: OSTI; NTIS; INIS; GPO Dep.

An updated version of RESRAD has been developed by Argonne National Laboratory for the US Department of Energy to derive site-specific soil guidelines for residual radioactive material. In this updated version, many new features have been added to the, RESRAD code. One of the options is that a user can input a solubility constant to limit the leaching of contaminants. The leaching model used in the code requires the input of an empirical distribution coefficient, K_d , which represents the ratio of the solute concentration in soil to that in solution under equilibrium conditions. This paper describes the methodology developed to estimate an effective distribution coefficient, K_d , from the user-input solubility constant and the use of the effective K_d for predicting the leaching of contaminants.

407 (ANL/EA/CP-84163) Issues related to uncertainty in projections of hazardous and mixed waste volumes in the U.S. Department of Energy's environmental restoration program. Picel, K.C. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-107: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008289. Source: OSTI; NTIS; INIS; GPO Dep.

Projected volumes of contaminated media and debris at US Department of Energy (DOE) environmental restoration sites that are potentially subject to the hazardous waste provisions of the Resource Conservation and Recovery Act are needed to support programmatic planning. Such projections have been gathered in various surveys conducted under DOE's environmental restoration and waste management programs. It is expected that reducing uncertainty in the projections through review of existing site data and process knowledge and through further site characterization will result in substantially lowered projections. If promulgated, the US Environmental Protection Agency's Hazardous Waste Identification Rule would result in potentially even greater reductions in the projections when site conditions are reviewed under the provisions of the new rule. Reducing uncertainty in projections under current and future waste identification rules may be necessary to support effective remediation planning. Further characterization efforts that may be conducted should be designed to limit uncertainty in identifying volumes of wastes to the extent needed to support alternative selection and to minimize costs of remediation.

408 (ANL/EA/CP-84360) Progress on integrating environmental restoration data into mixed waste updates. Tolbert-Smith, M. (USDOE, Washington, DC (United States)); MacDonell, M.; Peterson, J.; Kirkpatrick, T. Argonne National Lab., IL (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-106: Waste

management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008290. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Compliance Act required the Department of Energy to compile specific information on the volumes, characteristics, and treatment plans for mixed wastes, and to provide this information to the Environmental Protection Agency and affected states. The initial format for reporting this information was developed largely on the basis of operations wastes. Although this format is acceptable for stored environmental restoration wastes, it was found to be poorly suited for reporting wastes that could be generated by future cleanup activities, many of which have not yet been well defined. Modifications to the process initially used to report restoration wastes were made to allow them to be reported in a manner that more accurately reflects uncertainties inherent in such estimates. This revised approach allowed for the smooth integration of data for restoration wastes with those compiled by the waste management team for mixed waste inventory updates.

409 (ANL/EA/CP-85596) The modeling of contaminant flow during proposed treatment of U.S. Department of Energy low-level radioactive mixed wastes. Dolak, D.A.; Wilkins, B.D.; Kotek, T.J.; Wang, Y.Y.; Meshkov, N.K. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-101: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008281. Source: OSTI; NTIS; INIS; GPO Dep.

Estimations of waste materials throughput and the potential radiological and chemical releases resulting from the proposed treatment of US Department of Energy (DOE) low-level mixed wastes (LLMWs) were used to support analyses of risks and costs associated with various waste management alternatives outlined in the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS). The modeling of material flow and contaminant releases through a consolidated waste management flowchart was performed by the WASTE.MGMT computational model developed by Argonne National Laboratory. This paper (1) briefly describes the process used to model estimated material and contaminant flow through the proposed treatment scenarios for the EM PEIS, (2) discusses the key site- and/or waste-stream-dependent factors involved in the determination of radiological and chemical emissions, and (3) explains the assumptions used to integrate the available LLMW database with the computational model.

410 (ANL/EAD/TM-16) Preliminary characterization of the 100 area at Argonne National Laboratory. Biang, C.; Biang, R.; Patel, P. Argonne National Lab., IL (United States). Jun 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94015350. Source: OSTI; NTIS; INIS; GPO Dep.

This characterization report is based on the results of sampling and an initial environmental assessment of the 100 Area of Argonne National Laboratory. It addresses the current status, projected data requirements, and recommended actions for five study areas within the 100 Area: the Lime Sludge Pond, the Building 108 Liquid Retention Pond, the Coal Yard, the East Area Burn Pit, and the Eastern Perimeter Area. Two of these areas are solid waste management units under the Resource Conservation and Recovery Act (the Lime Sludge Pond and the Building 108

Liquid Retention Pond); however, the Illinois Environmental Protection Agency has determined that no further action is necessary for the Lime Sludge Pond. Operational records for some of the activities were not available, and one study area (the East Area Burn Pit) could not be precisely located. Recommendations for further investigation include sample collection to obtain the following information: (1) mineralogy of major minerals and clays within the soils and underlying aquifer, (2) pH of the soils, (3) total clay fraction of the soils, (4) cation exchange capacity of the soils and aquifer materials, and (5) exchangeable cations of the soils and aquifer material. Various other actions are recommended for the 100 Area, including an electromagnetic survey, sampling of several study areas to determine the extent of contamination and potential migration pathways, and sampling to determine the presence of any radionuclides. For some of the study areas, additional actions are contingent on the results of the initial recommendations.

411 (ANL/ES/CP-85390) Vitrification of low-level and mixed wastes. Johnson, T.R.; Bates, J.K.; Feng, Xiandong. Argonne National Lab., IL (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-941210-7: Power generation conference, Orlando, FL (United States), 7-9 Dec 1994). Order Number DE95008408. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) and nuclear utilities have large quantities of low-level and mixed wastes that must be treated to meet repository performance requirements, which are likely to become even more stringent. The DOE is developing cost-effective vitrification methods for producing durable waste forms. However, vitrification processes for high-level wastes are not applicable to commercial low-level wastes containing large quantities of metals and small amounts of fluxes. New vitrified waste formulations are needed that are durable when buried in surface repositories.

412 (ANL/ET/CP-82151) Stabilization of low-level mixed waste in chemically bonded phosphate ceramics. Wagh, A.S. (Argonne National Lab., IL (United States)); Singh, D.; Sarkar, A.V.; Mayberry, J. Argonne National Lab., IL (United States). Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-64: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015031. Source: OSTI; NTIS; INIS; GPO Dep.

Mixed waste streams, which contain both chemical and radioactive wastes, are one of the important categories of DOE waste streams needing stabilization for final disposal. Recent studies have shown that chemically bonded phosphate ceramics may have the potential for stabilizing these waste streams, particularly those containing volatiles and pyrophorics. Such waste streams cannot be stabilized by conventional thermal treatment methods such as vitrification. Phosphate ceramics may be fabricated at room temperature into durable, hard and dense materials. For this reason room-temperature-setting phosphate ceramic waste forms are being developed to stabilize these to "problem waste streams."

413 (ANL/ET/CP-82489) Chemically bonded phosphate ceramics for low-level mixed waste stabilization. Singh, D. (Argonne National Lab., IL (United States)); Wagh, A.S.; Cunnane, J.C.; Mayberry, J.L. Argonne National Lab.,

IL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409178-13: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95005840. Source: OSTI; NTIS; INIS; GPO Dep.

Novel chemically bonded phosphate ceramics (CBPCs) are being developed and fabricated for low-temperature stabilization and solidification of mixed waste streams which are amenable to conventional high-temperature stabilization processes due to presence of volatiles such as heavy metal chloride and fluorides and/or pyrophorics in the wastes. Phosphates of Mg, Mg-Na and Zr are being developed as candidate matrix materials. In this paper, we present the fabrication procedures of phosphate waste forms using surrogate compositions of three typical mixed wastes streams - ash, cement sludges, and salts. The performance of the final waste forms such as compression strength, leachability of the contaminants, durability in aqueous environment were conducted. In addition, parameteric studies have been conducted to establish the optimal waste loading in a particular binder system. Based on the results, we present potential applications in the treatment of various mixed waste streams.

414 (ANL/ET/CP-83175) Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization. Wagh, A.S.; Singh, D. Argonne National Lab., IL (United States). Energy Technology Div. Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940983-4: 2. international symposium and exhibition on environmental contamination in Central and Eastern Europe, Budapest (Hungary), 20-23 Sep 1994). Order Number DE95002904. Source: OSTI; NTIS; INIS; GPO Dep.

Chemically bonded phosphate ceramics (CBCs) were investigated for low-temperature stabilization and solidification of DOE mixed wastes where conventional high-temperature treatments cannot be used due to presence of volatiles and pyrophorics in the wastes. This article deals with stabilization of chemical contaminants. Phosphate ceramics of Mg, Mg-Na and Zr are being investigated as candidate materials. The authors discuss the basic properties of the phosphate waste forms made with surrogates of typical DOE mixed wastes with an emphasis on ash waste stream. The performance of the final waste forms, including leachability of the contaminants durability of the final waste forms in aqueous environment, and strength of the waste forms are discussed in detail. Based on the results, the authors present possible economic applications of these materials.

415 (ANL/EWM/CP-82955) An Innovative approach to solid Low Level Radioactive Waste processing and disposal. Pancake, D.C. Jr.; Sodaro, M.A. Argonne National Lab., IL (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-62: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015090. Source: OSTI; NTIS; INIS; GPO Dep.

This paper will focus on a new system of Low Level Radioactive Waste (LLW) accumulation, processing and packaging, as-well as the implementation of a Laboratory-wide training program used to introduce new waste accumulation containers to all of the on-site radioactive waste generators, and to train them on the requirements of

this innovative waste characterization and documentation program.

416 (ANL/TD/CP-83100) Argonne-West Waste Characterization Area for mixed TRU waste. Duncan, D.S. (Argonne National Lab., Idaho Falls, ID (United States)); Dwight, C.C.; Parks, R.L.; Black, D.B.; Courtney, J.C. Argonne National Lab., IL (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-67: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015062. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory-West has developed characterize and repackage transuranic mixed waste, the Waste Characterization Area (WCA). This new facility is designed to current Department of Energy design criteria for radioactive waste handling facilities Characterization and repackaging of real waste within the WCA began in April 1994. Characterization operations include visual examination of solid waste and drum headspace and inner bag gas sample collection and analysis. Additions planned for the WCA in late 1994 include equipment for sludge waste core sample extraction, preparation, and analysis. This paper addresses general design strategy, facility features, and specialized equipment associated with the WCA.

417 (ANL/TD/CP-83149) The Plasma Hearth Process demonstration project for mixed waste treatment. Geimer, R. (Science Applications International Corp., Idaho Falls, ID (United States)); Dwight, C.; McClellan, G. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-84: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015060. Source: OSTI; NTIS; INIS; GPO Dep.

The Plasma Hearth Process (PHP) demonstration project is one of the key technology projects in the Department of Energy (DOE) Office of Technology Development (OTD) Mixed Waste Integrated Program (MWIP). Testing to date has yielded encouraging results in displaying potential applications for the PHP technology. Early tests have shown that a wide range of waste materials can be readily processed in the PHP and converted to a vitreous product. Waste materials can be treated in their original container as received at the treatment facility, without pretreatment. The vitreous product, when cooled, exhibits excellent performance in leach resistance, consistently exceeding the Environmental Protection Agency (EPA) Toxicity Characteristic Leaching Procedure (TCLP) requirements. Performance of the Demonstration System during test operations has been shown to meet emission requirements. An accelerated development phase, being conducted at both bench- and pilot-scale on both nonradioactive and radioactive materials, will confirm the viability of the process. It is anticipated that, as a result of this accelerated technology development and demonstration phase, the PHP will be ready for a final field-level demonstration within three years.

418 (ANL/TD/CP-83736) Use of nuclear facilities at Argonne-West to support new environmental missions. Black, D.B.; Dwight, C.C.; Lineberry, M.J. Argonne National Lab., Idaho Falls, ID (United States). Technology Development Div. Aug 1994. 13p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-1: Dixy Lee Ray memorial symposium on science-based environmental management, Seattle, WA (United States), 30 Aug - 2 sep 1994). Order Number DE94018352. Source: OSTI; NTIS; INIS; GPO Dep.

At Argonne National Laboratory-West, facilities that were originally constructed to support the development of liquid-metal reactor technology are being used to meet the environmental and waste management need of the US Department of Energy. These needs include waste characterization, waste testing, and waste treatment technology development. Waste characterization and repackaging activities are being performed in the Hot Fuel Examination Facility for the Waste Isolation Pilot Plant (WIPP) Experimental Test Program. Characterization activities include sampling the gas in actual waste containers, categorizing waste contents for their gas generation potential, and extracting solid samples. A new waste testing project will utilize the Zero Powered Physics Reactor facility. In the workroom of these facility, laboratory gas generation experiments will be conducted with contact-handled transuranic waste. Both the characterization and waste testing activities are part of the effort to prepare the WIPP performance assessment. Waste treatment demonstrations have or will be conducted at the Transient Reactor Test facility and involve private sector participants. The demonstrations involve the development of thermal treatment for materials containing residual amounts of plutonium using plasma-arc technology. The success of these new programs is largely due to experience gained from past missions in such areas as radiological control and nuclear safety.

419 (ANL/TD/CP-84267) Results of detailed characterization on CH-TRU mixed waste at Argonne National Laboratory-West. Dwight, C.C.; Jensen, B.A.; Duncan, D.S. Argonne National Lab., IL (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-64: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008277. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory-West and Lockheed Idaho Technologies Company have jointly participated in the Department of Energy's (DOE) Waste Isolation Pilot Plant Experimental Test Program since 1990. A new facility at Argonne was developed to improve the effectiveness and efficiency of contact-handled transuranic mixed waste characterization and to decrease the potential for facility contamination and personnel exposures. This new facility, the Waste Characterization Area, was approved for radioactive operations in March 1994. Between April and September 1994, forty-two waste drums containing mixed debris waste were characterized to support a study being performed to evaluate volatile organic compound concentrations in the void volume headspaces of waste drums. This paper presents the results of characterization performed at Argonne, emphasizing parameters important from a facility standpoint. Specifically, information is presented on drum surface dose rate, fissile content, number and type of gas samples, volatile organic compound concentration, and facility contamination levels. Actual values are compared to enveloping conditions assumed in the safety assessment for the characterization facility. Argonne-West is one of the first DOE sites to perform detailed waste characterization under the DOE's Transuranic Waste Characterization Program. The information presented herein could aid other storage

and generator sites in developing characterization procedures and facilities.

420 (ANL/TD/CP-84268) **Argonne-West facility requirements for a radioactive waste treatment demonstration.** Dwight, C.C.; Felicione, F.S.; Black, D.B.; Kelso, R.B.; McClellan, G.C. Argonne National Lab., IL (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-108: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95008291. Source: OSTI; NTIS; INIS; GPO Dep.

At Argonne National Laboratory-West (ANL-W), near Idaho Falls, Idaho, facilities that were originally constructed to support the development of liquid-metal reactor technology are being used and/or modified to meet the environmental and waste management research needs of DOE. One example is the use of an Argonne-West facility to conduct a radioactive waste treatment demonstration through a cooperative project with Science Applications International Corporation (SAIC) and Lockheed Idaho Technologies Company. The Plasma Hearth Process (PHP) project will utilize commercially-adapted plasma arc technology to demonstrate treatment of actual mixed waste. The demonstration on radioactive waste will be conducted at Argonne's Transient Reactor Test Facility (TREAT). Utilization of an existing facility for a new and different application presents a unique set of issues in meeting applicable federal state, and local requirements as well as the additional constraints imposed by DOE Orders and ANL-W site requirements. This paper briefly describes the PHP radioactive demonstrations relevant to the interfaces with the TREAT facility. Safety, environmental design, and operational considerations pertinent to the PHP radioactive demonstration are specifically addressed herein. The personnel equipment, and facility interfaces associated with a radioactive waste treatment demonstration are an important aspect of the demonstration effort. Areas requiring significant effort in preparation for the PHP Project being conducted at the TREAT facility include confinement design, waste handling features, and sampling and analysis considerations. Information about the facility in which a radioactive demonstration will be conducted, specifically Argonne's TREAT facility in the case of PHP, may be of interest to other organizations involved in developing and demonstrating technologies for mixed waste treatment.

421 (BNL-49873) **Off-gas recycle for long-term low temperature gas phase uranium decontamination.** Bundy, R.D.; Bunch, D.H.; Munday, E.B.; Simmons, D.W. Oak Ridge K-25 Site, TN (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. (CONF-940853-1: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94015149. Source: OSTI; NTIS; GPO Dep.

In situ long-term low-temperature (LTLT) gas phase decontamination is being developed and demonstrated at the K-25 site as a technology that has the potential to substantially lower these costs while reducing criticality and safeguards concerns and worker exposure to hazardous and radioactive materials. The objective of gas phase decontamination is to employ a gaseous reagent to fluorinate nonvolatile uranium deposits to form volatile UF_6 , which can be recovered by chemical trapping or freezing. The LTLT process permits the decontamination of the inside of gas-tight GDP process equipment at room temperature by substituting a long exposure to subatmospheric ClF_3 for higher reaction rates at

higher temperatures. Laboratory-scale experiments have demonstrated the feasibility of using LTLT gas phase decontamination with ClF_3 to remove uranium deposits from this equipment. A mobile gas phase system is being designed to demonstrate the decontamination process on a full scale. If used to decontaminate the GDPs, the LTLT process would use large amounts of ClF_3 and exhaust large volumes of by-product gases (ClF , ClO_2F , etc.). Initially, the excess ClF_3 and reaction byproducts will be destroyed in a KOH scrubber. This paper describes a proposed system that could recover the excess ClF_3 and regenerate the reaction byproducts into ClF_3 for use in decontamination of additional equipment. Use of this regeneration and recovery system would reduce raw material costs and also reduce the waste scrubber sludge disposal costs by reducing the amount of corrosive gases fed to the scrubber.

422 (BNL-52452) **Prospects for pyrolysis technologies in managing municipal, industrial, and DOE cleanup wastes.** Reaven, S.J. (State Univ. of New York, Stony Brook, NY (United States)). Brookhaven National Lab., Upton, NY (United States); State Univ. of New York, Stony Brook, NY (United States). Dec 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95006729. Source: OSTI; NTIS; INIS; GPO Dep.

Pyrolysis converts portions of municipal solid wastes, hazardous wastes, and special wastes such as tires, medical wastes, and even old landfills into solid carbon and a liquid or gaseous hydrocarbon stream. Pyrolysis heats a carbonaceous waste stream typically to 290-900 C in the absence of oxygen, and reduces the volume of waste by 90% and its weight by 75%. The solid carbon char has existing markets as an ingredient in many manufactured goods, and as an adsorbent or filter to sequester certain hazardous wastes. Pyrolytic gases may be burned as fuel by utilities, or liquefied for use as chemical feedstocks, or low-pollution motor vehicle fuels and fuel additives. This report analyzes the potential applications of pyrolysis in the Long Island region and evaluates for the four most promising pyrolytic systems their technological and commercial readiness, their applicability to regional waste management needs, and their conformity with DOE requirements for environmental restoration and waste management. This summary characterizes their engineering performance, environmental effects, costs, product applications, and markets. Because it can effectively treat those wastes that are inadequately addressed by current systems, pyrolysis can play an important complementing role in the region's existing waste management strategy. Its role could be even more significant if the region moves away from existing commitments to incineration and MSW composting. Either way, Long Island could become the center for a pyrolysis-based recovery services industry serving global markets in municipal solid waste treatment and hazardous waste cleanup. 162 refs.

423 (BNL-61006) **A summary of the report on prospects for pyrolysis technologies in managing municipal, industrial, and Department of Energy cleanup wastes.** Reaven, S.J. Brookhaven National Lab., Upton, NY (United States). Aug 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95005003. Source: OSTI; NTIS; GPO Dep.

Pyrolysis converts portions of municipal solid wastes, hazardous wastes and special wastes such as tires, medical wastes and even old landfills into solid carbon and a liquid

or gaseous hydrocarbon stream. In the past twenty years, advances in the engineering of pyrolysis systems and in sorting and feeding technologies for solid waste industries have ensured consistent feedstocks and system performance. Some vendors now offer complete pyrolysis systems with performance warranties. This report analyzes the potential applications of pyrolysis in the Long Island region and evaluates the four most promising pyrolytic systems for their readiness, applicability to regional waste management needs and conformity with DOE environmental restoration and waste management requirements. This summary characterizes the engineering performance, environmental effects, costs, product applications and markets for these pyrolysis systems.

424 (BNL-61450) Proposed waste form performance criteria and testing methods for low-level mixed waste. Franz, E.M.; Fuhrmann, M.; Bowerman, B. Brookhaven National Lab., Upton, NY (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950216-68: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008366. Source: OSTI; NTIS; INIS; GPO Dep.

Proposed waste form performance criteria and testing methods were developed as guidance in judging the suitability of solidified waste as a physico-chemical barrier to releases of radionuclides and RCRA regulated hazardous components. The criteria follow from the assumption that release of contaminants by leaching is the single most important property for judging the effectiveness of a waste form. A two-tier regimen is proposed. The first tier consists of a leach test designed to determine the net, forward leach rate of the solidified waste and a leach test required by the Environmental Protection Agency (EPA). The second tier of tests is to determine if a set of stresses (i.e., radiation, freeze-thaw, wet-dry cycling) on the waste form adversely impacts its ability to retain contaminants and remain physically intact. In the absence of site-specific performance assessments (PA), two generic modeling exercises are described which were used to calculate proposed acceptable leachates.

425 (CONF-930408-84) US Department of Energy Mixed Waste Integrated Program performance systems analysis. Ferrada, J.J.; Berry, J.B. Oak Ridge National Lab., TN (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993. Order Number DE94018962. Source: OSTI; NTIS; INIS; GPO Dep.

The primary goal of this project is to support decision making for the U.S. Department of Energy (DOE)/EM-50 Mixed Waste Integrated Program (MWIP) and the Mixed Low-Level Waste Program. A systems approach to the assessment of enhanced waste form(s) production will be employed including, coordination and configuration management of activities in specific technology development tasks. The purpose of this paper is to describe the development and application of a methodology for implementing a performance systems analysis on mixed waste treatment process technologies. The second section describes a conventional approach to process systems analysis followed by a methodology to estimate uncertainties when analyzing innovative technologies. Principles from these methodologies have been used to develop a performance systems analysis

for MWIP. The third section describes the systems analysis tools. The fourth section explains how the performance systems analysis will be used to analyze MWIP process alternatives. The fifth and sixth sections summarize this paper and describe future work for this project. Baseline treatment process technologies (i.e., commercially available technologies) and waste management strategies are evaluated systematically using the ASPEN PLUS program applications developed by the DOE Mixed Waste Treatment Project (MWTP). Alternatives to the baseline (i.e., technologies developed by DOE's Office of Technology Development) are analyzed using FLOW, a user-friendly program developed at Oak Ridge National Laboratory (ORNL). Currently, this program is capable of calculating rough order-of-magnitude mass and energy balances to assess the performance of the alternative technologies as compared to the baseline process. In the future, FLOW will be capable of communicating information to the ASPEN PLUS program.

426 (CONF-930445-29) Image accuracy and representational enhancement through low-level, multi-sensor integration techniques. Baker, J.E. Oak Ridge National Lab., TN (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Society of Photo-Optical Instrumentation Engineers (SPIE) OE/aerospace science and sensing meeting; Orlando, FL (United States); 11-16 Apr 1993. Order Number DE94018661. Source: OSTI; NTIS; GPO Dep.

Multi-Sensor Integration (MSI) is the combining of data and information from more than one source in order to generate a more reliable and consistent representation of the environment. The need for MSI derives largely from basic ambiguities inherent in our current sensor imaging technologies. These ambiguities exist as long as the mapping from reality to image is not 1-to-1. That is, if different "realities" lead to identical images, a single image cannot reveal the particular reality which was the truth. MSI techniques attempt to resolve some of these ambiguities by appropriately coupling complementary images to eliminate possible inverse mappings. What constitutes the best MSI technique is dependent on the given application domain, available sensors, and task requirements. MSI techniques can be divided into three categories based on the relative information content of the original images with that of the desired representation: (1) "detail enhancement," wherein the relative information content of the original images is less rich than the desired representation; (2) "data enhancement," wherein the MSI techniques are concerned with improving the accuracy of the data rather than either increasing or decreasing the level of detail; and (3) "conceptual enhancement," wherein the image contains more detail than is desired, making it difficult to easily recognize objects of interest. In conceptual enhancement one must group pixels corresponding to the same conceptual object and thereby reduce the level of extraneous detail.

427 (CONF-9304128-22) Calibration and operation of continuous air monitors for alpha-emitting radionuclides. Hoover, M.D.; Newton, G.J. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. Order Number DE95006165. Source: OSTI; NTIS; INIS; GPO Dep.

Spectrometer-based continuous air monitors have improved our capabilities for detecting aerosols of alpha-emitting radionuclides. This paper describes basic requirements and statistical limitations in the sensitivity of alpha continuous air monitors, and presents a technical basis for selecting the energy window for detection of uranium and plutonium aerosols, correcting for interference from airborne dust, selecting filters with low pressure drop and good front surface collection characteristics, and properly using electroplated calibration sources. Sensitivity limits are described for detecting uranium or plutonium aerosols in the presence of increased concentrations of naturally occurring, alpha-emitting radon progeny radionuclides. Decreasing the lower energy boundary of the detection window from 4.3 MeV to 2.7 MeV improves by a factor of three the detection of plutonium in the presence of dust, while causing minimal additional interference from ambient radon progeny. Selection of the Millipore Fluoropore teflon membrane filter reduces both pressure drop and interference from ambient radon progeny by up to a factor of two. Field collection of ambient radon progeny can be used to verify the proper energy of alpha emissions from electroplated calibration sources. In the absence of energy verification, errors in instrument calibration may result from solid state diffusion of the electroplated calibration radionuclide into the substrate plate.

428 (CONF-930769-5) **In situ peroxidation of TCE contaminated soil.** Gates, D.D.; Siegrist, R.L. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1993 joint Canadian Society of Civil Engineers-American Society of Civil Engineers (CSCE-ASCE) national conference on environmental engineering; Montreal (Canada); 12-14 Jul 1993. Order Number DE94019116. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory bench- and pilot-scale studies were conducted to evaluate the effectiveness of hydrogen peroxide (H_2O_2) oxidation for in situ treatment of volatile organic compounds (VOCs) in contaminated soils and sediments. Bench scale studies using gas tight 1 liter vessels demonstrated that the addition of weak H_2O_2 solutions (<7% by weight) to trichloroethylene (TCE) contaminated soil slurries resulted in the removal of up to 98% of the TCE. In pilot-scale studies up to 87% of influent TCE was removed when 5% H_2O_2 was added to the soil columns at a volume equal to 10% of the total volume of the soil to be treated. The effect of H_2O_2 addition on soil properties was also evaluated in the pilot studies.

429 (CONF-930873-, pp. 10.2.1-10.2.7) **Mediated electrochemical oxidation of mixed wastes.** Chiba, Z. (Lawrence Livermore National Lab., CA (United States)). American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. DOE Contract W-7405-ENG-48. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

The Mediated Electrochemical Oxidation process was studied for destroying low-level combustible mixed wastes at Rocky Flats Plant. Tests were performed with non-radioactive surrogate materials: Trimsol for contaminated cutting oils, and reagent-grade cellulose for contaminated cellulosic wastes. Extensive testing was carried out on Trimsol in both small laboratory-scale apparatus and on a

large-scale system incorporating an industrial-size electrochemical cell. Preliminary tests were also carried out in the small-scale system with cellulose. Operating and system parameters that were studied were: Use of a silver-nitric acid versus a cobalt-sulfuric acid system, effect of electrolyte temperature, effect of acid concentration, and effect of current density. Destruction and coulombic efficiencies were calculated using data obtained from continuous carbon dioxide monitors and total organic carbon analysis of electrolyte samples. For Trimsol, the best performance was achieved with the silver-nitrate system at high acid concentrations, temperatures, and current densities. Destruction efficiencies of 99% or greater, and coulombic efficiencies up to 70% were obtained. For the cellulose, high destruction efficiencies and reasonable coulombic efficiencies were obtained for both silver-nitrate and cobalt-sulfuric systems.

430 (CONF-930873-, pp. 10.3.1-10.3.16) **Treatment of a simulated mixed waste with supercritical water oxidation.** Shapiro, C. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Garcia, K.; Beller, J. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. DOE Contract AC07-76ID01570. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a series of tests using supercritical water oxidation (SCWO) to process cutting oil containing a simulated radionuclide. The goal of the tests was to evaluate the technology's ability to process a highly chlorinated waste representative of many mixed waste streams generated in the US DOE complex. The testing was conducted with a bench-scale SCWO system developed by the Modell Development Corp. Significant test objectives included process optimization for adequate destruction efficiency, tracking the radionuclide simulant and certain metals in the effluent streams, and assessment of reactor material degradation resulting from processing a highly chlorinated waste. Test results have been summarized from lab. analysis of the liquid effluent, and of the solid effluent, and witness wire data for corrosion and deposition evaluation.

431 (CONF-930873-, pp. 14.4.1-14.4.4) **Evaluation of treatment technologies for mixed waste soil containing mercury.** Hemmings, R.L. (Clemson Technical Center Inc., Anderson, SC (United States)); McCartney, D.E.; Hoffner, S.L.; Navratil, J.D.; Klein, A. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Treatment processes are being evaluated for conversion of mixed waste soil (containing mainly ^{137}Cs , ^{90}Sr , mercury, organics, etc.) to a radioactive waste. A preliminary evaluation was conducted on soils spiked with mercury and trichloroethane using vacuum retorting and stabilization methods. The results of these experiments verify good removal and fixing of mercury. A commercial thermal desorption process was next tested on a representative mixed waste soil sample. The thermal process uses an externally-fired rotary dryer, and in these tests, the dryer was operated

at both 370 and 480 C with a residence time of 85 minutes. The volatiles are driven off the soil by heat, then transported by nitrogen carrier gas. The carrier gas flows to a gas treatment system where organic, mercury and water vapors are removed and recovered from the gas. The thermal process effectively removed organics and mercury from the mixed waste soil sample.

432 (CONF-930873-, pp. 14.6.1-14.6.9) **Bioprocessing scenarios for mixed hazardous waste.** Wolfram, J.H. (EG&G Idaho, Idaho Falls, ID (United States)); Rogers, R.D.; Prisc, M.; Silver, G.; Attala, A. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

The potential of biological processing of mixed hazardous waste has not been determined. However, the use of selected microorganisms for the degradation and/or detoxification of hazardous organic compounds is gaining wide acceptance as an alternative waste treatment technology. The isolation of a unique strain of *Pseudomonas putida* Idaho seems well adapted to withstand the demands of the input stream comprised of liquid scintillation waste. This paper describes the results from the continuous processing of a mixture comprised of p-xylene and surfactant. The process is now at the demonstration phase at one of US DOE's facilities which has a substantial amount of stored waste of this type.

433 (CONF-930873-, pp. 2.2.1-2.2.9) **Development of treatment technologies for the processing of US Department of Energy mixed waste.** Backus, P.M. (Oak Ridge National Lab., TN (United States)); Berry, J.B.; Coyle, G.J.; Lurk, P.W.; Wolf, S.M. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Waste contaminated with chemically hazardous and radioactive species is defined as mixed waste. Significant technology development has been conducted for separate treatment of hazardous and radioactive waste, but technology development addressing mixed-waste treatment has been limited. In response to the need for a comprehensive and consistent approach to mixed-waste technology development, the Office of Technology Development of the US DOE has established the Mixed Waste Integrated Program. The program is identifying and evaluating treatment technologies to treat present and estimated future mixed wastes at DOE sites. The status of the technical initiatives in chemical/physical treatment, waste destruction/stabilization technology, off-gas treatment, and final waste form production/assessment is described in this paper.

434 (CONF-930873-, pp. 3.1.1-3.1.7) **Mixed waste: Before treatment, storage and disposal.** Conway, S. (Colorado Center for Environmental Management, Golden, CO (United States)). American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee;

Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

If we are to address the problems associated with mixed waste, those responsible for it must understand and take into account not only the regulatory context and technical information, but also public concerns. They must do so at the earliest stages of developing potential solutions to the licensing/permitting, handling, treating, storing, and disposing of mixed waste. This demand places a premium on approaches that promote the participation of all the diverse segments of the public in decision-making about mixed waste issues. The management of containerized and low level mixed wastes is a problem at many locations within the DOE Complex. Satisfactory characterization, treatment, and/or disposal of the contents of these containers involve diverse technical, regulatory, public health, and safety issues. Opening containers to determine their waste presents potential health and safety threats to the immediate workers and the surrounding population. Technologies and techniques for non-intrusive analysis are not readily available. Further, characterization requirements could vary significantly depending upon the treatment and disposal options selected. Decisions on characterization and treatment/disposal are directly driven by regulatory requirements (including the requirements of the disposal sites chosen), treatment parameters, the ultimate disposal site, transportation routes, and, it should go without saying, public acceptability.

435 (CONF-930873-, pp. 4.3.1-4.3.9) **Pilot scale vitrification studies on hazardous and mixed wastes.** Bennert, D.M. (Clemson Univ. Environmental Systems Engineering, SC (United States)); Overcamp, T.J.; Compton, K.L.; Sargent, T.N. Jr.; Resce, J.L.; Bickford, D.F. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Clemson Univ. Environmental Systems Engineering, in cooperation with research partners Westinghouse Savannah River Co., EnVitCo, Inc., and Stir-Melter, Inc., has established a center for pilot scale waste vitrification research. The purpose of the center is to conduct vitrification feasibility studies and environmental impact studies on various defense and industrial hazardous and mixed wastes. Treatability studies are being conducted on several hazardous wastes and surrogates of hazardous and mixed wastes. Tests include treatment of contaminated concrete, wastewater treatment sludges, ion exchange resins, incinerator ash, and electronic circuit boards. The program will include tests to control precious metal separation and organic destruction as an integral part of the melter operation, while incorporating heavy metals into the glass matrix.

436 (CONF-930873-, pp. 7.1.1-7.1.5) **Critical operating parameters for microwave solidification of hydroxide sludge.** Sprenger, G.S. (EG&G Rocky Flats, Golden, CO (United States)); Eschen, V.G. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health.

[1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Engineers at the Rocky Flats Plant (RFP) have developed an innovative technology for the treatment of homogeneous wet or dry solids which are contaminated with hazardous and/or radioactive materials. The process uses microwave energy to heat and melt the waste into a vitreous final form that is suitable for land disposal. The advantages include a high density, leach resistant, robust waste form; volume and toxicity reduction; favorable economics; in-container treatment; good public acceptance; isolated equipment; and instantaneous energy control. Regulatory certification of the final form is accomplished by meeting the limitation specified in US EPA's Toxicity Characteristic Leach Procedure. This paper presents the results from a series of tests performed on a surrogate hydroxide coprecipitation sludge spiked with heavy metals at elevated concentrations. The results are very encouraging and support RFP's commitment to the use of microwave technology for treatment of various waste streams.

437 (CONF-930873—, pp. 7.3.1-7.3.7) **Molten salt oxidation of radioactive hydraulic oil waste.** Darnell, A.J. (Rockwell International, Canoga Park, CA (United States)); Gay, R.L.; Navratil, J.D.; Newcomb, J.C. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Molten Salt Oxidation (MSO) technology, developed by Rockwell International from the 1970s through the early 1980s, yielded results which indicated an excellent potential for treating hazardous and radioactive wastes; however, interest in MSO declined in the late 1980s because of the availability of less expensive treatment technologies. The US DOE has recently shown interest in MSO because of its potential advantages over existing processes in the treatment of mixed wastes.

438 (CONF-930873—34) **Development of treatment technologies of the processing of U.S. Department of Energy mixed waste.** Backus, P.M. (Oak Ridge National Lab., TN (United States)); Berry, J.B.; Coyle, G.J. Jr.; Lurk, P.; Wolf, S.M. Oak Ridge National Lab., TN (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. Order Number DE94018667. Source: OSTI; NTIS; INIS; GPO Dep.

Waste contaminated with chemically hazardous and radioactive species is defined as mixed waste. Significant technology development has been conducted for separate treatment of hazardous and radioactive waste, but technology development addressing mixed-waste treatment has been limited. In response to the need for a comprehensive and consistent approach to mixed-waste technology development, the Office of Technology Development of the US Department of Energy (DOE) has established the Mixed Waste Integrated Program. The program is identifying and evaluating treatment technologies to treat present and estimated future mixed wastes at DOE sites. The status of the technical initiatives in chemical/physical treatment, waste

destruction/stabilization technology, off-gas treatment, and final waste form production/assessment is described in this paper.

439 (CONF-9309139—12) **Laboratory interface in support of Environmental Restoration Programs.** Pardue, G.J. Jr. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 20. American Society for Quality Control (ASQC) national energy and environmental annual conference; Indian Wells, CA (United States); 19-22 Sep 1993. Order Number DE94013265. Source: OSTI; NTIS; INIS; GPO Dep.

A vital part of quality environmental data resides in the communication between the project and the analytical laboratory. It is essential that the project clearly identify its objectives to the laboratory and that the laboratory understands the scope and limitations of the analytical process. Successful completion of an environmental project must include an aggressive program between project managers and subcontracted analytical laboratories. All too often, individuals and organizations tend to deflect errors and failures observed in environmental toward "the other guy". The engineering firm will blame the laboratory, the laboratory will blame the field operation, the field operation will blame the engineering, and everyone will blame the customer for not understanding the true variables in the environmental arena. It is the contention of the authors, that the majority of failures derive from a lack of communication and misunderstanding. Several initiatives can be taken to improve communication and understanding between the various pieces of the environmental data quality puzzle. This presentation attempts to outline mechanisms to improve communication between the environmental project and the analytical laboratory with the intent of continuous quality improvement. Concepts include: project specific laboratory statements of work which focus on project and program requirements; project specific analytical laboratory readiness reviews (project kick-off meetings); laboratory team workshops; project/program performance tracking and self assessment and promotion of team success.

440 **Development of methodology to evaluate microbially influenced degradation of cement-solidified low-level radioactive waste forms.** Rogers, R.D. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Hamilton, M.A.; Veeh, R.H.; McConnell, J.W. pp. 349-356 of Scientific basis for nuclear waste management XVII. Barkatt, A. (ed.); Van Konyneburg, R.A. (ed.). Materials Research Society, Pittsburgh, PA (United States) (1994). pp. 964 DOE Contract AC07-76ID01570. From Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 29 Nov - 3 Dec 1993.

Because of its apparent structural integrity, cement has been widely used in the United States as a binder to solidify Class B and C low-level radioactive waste (LLW). However, the resulting cement preparations are susceptible to failure due to the actions of stress and environment. An environmentally mediated process that could affect cement stability is the action of naturally occurring microorganisms. The US Nuclear Regulatory Commission (NRC), recognizing this eventuality, stated that the effects of microbial action on waste form integrity must be addressed. This paper provides present results from an ongoing program that addresses the effects of microbially influenced degradation (MID) on cement-solidified LLW. Data are provided on the development of an evaluation method using acid-producing

bacteria. Results are from work with one type of these bacteria, the sulfur-oxidizing *Thiobacillus*. This work involved the use of a system in which laboratory- and vendor-manufactured, simulated waste forms were exposed on an intermittent basis to media containing thiobacilli. Testing demonstrated that MID has the potential to severely compromise the structural integrity of ion-exchange resin and evaporator-bottoms waste that is solidified with cement. In addition, it was found that a significant percentage of calcium and other elements were leached from the treated waste forms. Also, the surface pH of the treated specimens decreased to below 2. These conditions apparently contributed to the physical deterioration of simulated waste forms after 60 days of exposure to the thiobacilli.

441 (CONF-940212-1) Initial estimates of samples and residues requiring transport arising from the US Department of Energy's analytical services program. Pope, R.B. (Oak Ridge National Lab., TN (United States)); Bisaria, A.; Michelhaugh, R.D.; Conroy, M.J. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Seminar on developments in radioactive waste transport; Vienna (Austria); 21-25 Feb 1994. Order Number DE94009176. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has created the Office of Environmental Restoration and Waste Management (EM) to address the diverse complex problems associated with the remediation of DOE sites. Included in the EM office are two companion divisions that are playing vital roles in preparing, monitoring and implementing the remediation process. These divisions are the Transportation Management Division (TMD) and the Laboratory Management Division (LMD). A large number of shipments to and from the laboratories performing sample analysis will be required. The materials to be shipped will usually be hazardous, and many of them will be radioactive. The LMD has issued initial detailed plans for proceeding in this effort. This includes the development of a 5-year plan, and progress toward the scoping of sample needs on a site-by-site basis. As a result, the packaging and transportation planning by TMD, in support of LMD, has now begun in earnest. The initial efforts and findings, in terms of initial estimates of materials to be shipped, are provided in this paper. Issues relating to package design which have been identified are briefly discussed.

442 (CONF-940225-123) Oak Ridge background soils project provides data for remedial action evaluation. Watkins, D.R. (Oak Ridge National Lab., TN (United States)); Lee, S.Y.; Hatmaker, T.L.; McGinn, C.W.; Nourse, B.D.; Schmoeyer, R.L.; Burgoa, B.B.; Lietzke, D.A. Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94017866. Source: OSTI; NTIS; INIS; GPO Dep.

Many constituents of potential concern for human health occur naturally at low concentrations in soils. The primary objective of the Background Soil Characterization Project (BSCP) was to provide fully validated and defensible, reservation-wide background concentration data on significant potential contaminants of concern (organics, inorganics, and radionuclides) in natural soils on the Oak Ridge Reservation (ORR). The data are particularly significant for remedial action projects; the data can be used to establish

technical guidance and the basis for realistic cleanup requirements at hazardous waste sites on the reservation. Other objectives included providing baseline data for conducting contaminated site assessments and quantifying estimates of human health risk associated with background levels of potentially hazardous constituents in soils.

443 (CONF-940433-7) Process simulation and uncertainty analysis of plasma arc mixed waste treatment. Ferrada, J.J.; Welch, T.D. Oak Ridge National Lab., TN (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Spring meeting of the American Institute of Chemical Engineers; Atlanta, GA (United States); 17-21 Apr 1994. Order Number DE94019144. Source: OSTI; NTIS; INIS; GPO Dep.

Innovative mixed waste treatment subsystems have been analyzed for performance, risk, and life-cycle cost as part of the U.S. Department of Energy's (DOE's) Mixed Waste Integrated Program (MWIP) treatment alternatives development and evaluation process. This paper concerns the analysis of mixed waste treatment system performance. Performance systems analysis includes approximate material and energy balances and assessments of operability, effectiveness, and reliability. Preliminary material and energy balances of innovative processes have been analyzed using FLOW, an object-oriented, process simulator for waste management systems under development at Oak Ridge National Laboratory. The preliminary models developed for FLOW provide rough order-of-magnitude calculations useful for sensitivity analysis. The insight gained from early modeling of these technologies approximately will ease the transition to more sophisticated simulators as adequate performance and property data become available. Such models are being developed in ASPEN by DOE's Mixed Waste Treatment Project (MWTP) for baseline and alternative flow sheets based on commercial technologies. One alternative to the baseline developed by the MWIP support groups in plasma arc treatment. This process offers a noticeable reduction in the number of process operations as compared to the baseline process because a plasma arc melter is capable of accepting a wide variety of waste streams as direct inputs (without sorting or preprocessing). This innovative process for treating mixed waste replaces several units from the baseline process and, thus, promises an economic advantage. The performance in the plasma arc furnace will directly affect the quality of the waste form and the requirements of the off-gas treatment units. The ultimate objective of MWIP is to reduce the amount of final waste produced, the cost, and the environmental impact.

444 (CONF-940499-11) Mixed Waste Integrated Program emerging technology development. Berry, J.B. (Oak Ridge National Lab., TN (United States)); Hart, P.W. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Federal environmental restoration and waste minimization conference and exhibition; New Orleans, LA (United States); 25-29 Apr 1994. Order Number DE94012657. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is responsible for the management and treatment of its mixed low-level wastes (MLLW). MLLW are regulated under both the Resource Conservation and Recovery Act and various DOE orders. Over the next 5 years, DOE will manage over 1.2 m³ of MLLW and mixed transuranic (MTRU) wastes. In order to

successfully manage and treat these mixed wastes, DOE must adapt and develop characterization, treatment, and disposal technologies which will meet performance criteria, regulatory approvals, and public acceptance. Although technology to treat MLLW is not currently available without modification, DOE is committed to developing such treatment technologies and demonstrating them at the field scale by FY 1997. The Office of Research and Development's Mixed Waste Integrated Program (MWIP) within the DOE Office of Environmental Management (EM), Office of Technology Development, is responsible for the development and demonstration of such technologies for MLLW and MTRU wastes. MWIP advocates and sponsors expedited technology development and demonstrations for the treatment of MLLW.

445 (CONF-9404160-1) Assessing mixed waste treatment technologies. Berry, J.B. (Oak Ridge National Lab., TN (United States)); Bloom, G.A.; Hart, P.W. Oak Ridge National Lab., TN (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Executive enterprises conference; Charleston, SC (United States); 25-26 Apr 1994. Order Number DE94012658. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is responsible for the management and treatment of its mixed low-level wastes (MLLW). As discussed earlier in this conference MLLW are regulated under both the Resource Conservation and Recovery Act and various DOE orders. During the next 5 years, DOE will manage over 1,200,000 m³ of MLLW and mixed transuranic (MTRU) waste at 50 sites in 22 states (see Table 1). The difference between MLLW and MTRU waste is in the concentration of elements that have a higher atomic weight than uranium. Nearly all of this waste will be located at 13 sites. More than 1400 individual mixed waste streams exist with different chemical and physical matrices containing a wide range of both hazardous and radioactive contaminants. Their containment and packaging vary widely (e.g., drums, bins, boxes, and buried waste). This heterogeneity in both packaging and waste stream constituents makes characterization difficult, which results in costly sampling and analytical procedures and increased risk to workers.

446 (CONF-9405159-2) Target parameter and error estimation using magnetometry. Norton, S.J. (Oak Ridge National Lab., TN (United States)); Witten, A.J.; Won, I.J.; Taylor, D. Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. From Unexploded ordnance detection and range-remediation conference; Golden, CO (United States); 17-19 May 1994. Order Number DE94013271. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The problem of locating and identifying buried unexploded ordnance from magnetometry measurements is addressed within the context of maximum likelihood estimation. In this approach, the magnetostatic theory is used to develop data templates, which represent the modeled magnetic response of a buried ferrous object of arbitrary location, iron content, size, shape, and orientation. It is assumed that these objects are characterized both by a magnetic susceptibility representing their passive response to the earth's magnetic field and by a three-dimensional magnetization vector representing a permanent dipole magnetization. Analytical models were derived for four types of targets: spheres,

spherical shells, ellipsoids, and ellipsoidal shells. The models can be used to quantify the Cramer-Rao (error) bounds on the parameter estimates. These bounds give the minimum variance in the estimated parameters as a function of measurement signal-to-noise ratio, spatial sampling, and target characteristics. For cases where analytic expressions for the Cramer-Rao bounds can be derived, these expressions prove quite useful in establishing optimal sampling strategies. Analytic expressions for various Cramer-Rao bounds have been developed for spherical- and spherical shell-type objects. An maximum likelihood estimation algorithm has been developed and tested on data acquired at the Magnetic Test Range at the Naval Explosive Ordnance Disposal Tech Center in Indian Head, Maryland. This algorithm estimates seven target parameters. These parameters are the three Cartesian coordinates (x, y, z) identifying the buried ordnance's location, the three Cartesian components of the permanent dipole magnetization vector, and the equivalent radius of the ordnance assuming it is a passive solid iron sphere.

447 (CONF-940815-43) Mixed Waste Integrated Program: Demonstrating technologies to meet the requirements of the Federal Facility Compliance Act. Berry, J.B. Oak Ridge National Lab., TN (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94014104. Source: OSTI; NTIS; INIS; GPO Dep.

Mixed waste is defined as "waste contaminated with chemically hazardous [governed by the Resource Conservation and Recovery Act (RCRA)] and radioactive species [governed by US Department of energy (DOE) orders]." The Mixed Waste Integrated Program (MWIP) is responding to the need for DOE mixed-waste treatment technologies that meet these dual regulatory requirements. MWIP is developing emerging and innovative treatment technologies to determine process feasibility. Technology demonstrations of fixed-hearth plasma arc and vitrification systems will be used to determine whether these processes are superior to existing technologies in reducing risk, minimizing life-cycle cost, and improving process performance. MWIP also provides a forum for stakeholder and customer involvement in the technology development process.

448 (CONF-940815-45) Adaptation of the TCLP and SW-846 methods to radioactive mixed waste. Griest, W.H.; Schenley, R.L.; Caton, J.E.; Wolfe, P.F. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94014107. Source: OSTI; NTIS; INIS; GPO Dep.

Modifications of conventional sample preparation and analytical methods are necessary to provide radiation protection and to meet sensitivity requirements for regulated constituents when working with radioactive samples. Adaptations of regulatory methods for determining "total" Toxicity Characteristic Leaching Procedure (TCLP) volatile and semivolatile organics and pesticides, and for conducting aqueous leaching are presented.

449 (CONF-940815-112) Mercury removal from solid mixed waste. Gates, D.D.; Morrissey, M.; Chava,

K.K.; Chao, K. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE95008846. Source: OSTI; NTIS; INIS; GPO Dep.

The removal of mercury from mixed wastes is an essential step in eliminating the temporary storage of large inventories of mixed waste throughout the Department of Energy (DOE) complex. Currently thermal treatment has been identified as a baseline technology and is being developed as part of the DOE Mixed Waste Integrated Program (MWIP). Since thermal treatment will not be applicable to all mercury containing mixed waste and the removal of mercury prior to thermal treatment may be desirable, laboratory studies have been initiated at Oak Ridge National Laboratory (ORNL) to develop alternative remediation technologies capable of removing mercury from certain mixed waste. This paper describes laboratory investigations of the KI/I₂ leaching processes to determine the applicability of this process to mercury containing solid mixed waste.

450 (CONF-9409219-7) Aqueous electrolyte modeling in ASPEN PLUS™. Bloomingburg, G.F. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Chemical Engineering); Simonson, J.M.; Moore, R.C.; Mesmer, R.E.; Cochran, H.D. Oak Ridge National Lab., TN (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95007008. Source: OSTI; NTIS; GPO Dep.

Includes vugraphs.

The presence of electrolytes in aqueous solutions has long been recognized as contributing to significant departures from thermodynamic ideality. The presence of ions in process streams can greatly add to the difficulty of predicting process behavior. The difficulties are increased as temperatures and pressures within a process are elevated. Because many chemical companies now model their processes with chemical process simulators it is important that such codes be able to accurately model electrolyte behavior under a variety of conditions. Here the authors examine the electrolyte modeling capability of ASPEN PLUS™, a widely used simulator. Specifically, efforts to model alkali metal halide and sulfate systems are presented. The authors show conditions for which the models within the code work adequately and how they might be improved for conditions where the simulator models fail.

451 (CONF-9409285-1) 3-D subsurface modeling within the framework of an environmental restoration information system: Prototype results using earthvision. Goeltz, R.T.; Zondlo, T.F. Oak Ridge National Lab., TN (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Federal geographic technology '94; Washington, DC (United States); 27 Sep 1994. Order Number DE95005389. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the DOE Oak Ridge Reservation (DOE-ORR) placement on the EPA Superfund National Priorities List in December of 1989, all remedial activities, including characterization, remedial alternatives selection, and implementation of remedial measures, must meet the combined requirements of RCRA, CERCLA, and NEPA. The Environmental Restoration Program, therefore, was established with

the mission of eliminating or reducing to prescribed safe levels the risks to the environment or to human health and safety posed by inactive and surplus DOE-ORR managed sites and facilities that have been contaminated by radioactive and surplus DOE-ORR managed sites and facilities that have been contaminated by radioactive, hazardous, or mixed wastes. In accordance with an established Federal Facilities Agreement (FFA), waste sites and facilities across the DOE-ORR have been inventoried, prioritized, and are being systematically investigated and remediated under the direction of Environmental Restoration. EarthVision, a product of Dynamic Graphics, Inc., that provides three-dimensional (3-D) modeling and visualization, was exercised within the framework of an environmental restoration (ER) decision support system. The goal of the prototype was to investigate framework integration issues including compatibility and value to decision making. This paper describes the ER program, study site, and information system framework; selected EarthVision results are shown and discussed. EarthVision proved effective in integrating complex data from disparate sources and in providing 3-D visualizations of the spatial relationships of the data, including contaminant plumes. Work is under way to expand the analysis to the full site, covering about 1600 acres, and to include data from new sources, particularly remote-sensing studies.

452 (CONF-941015-2) Non-invasive shallow seismic source comparison for hazardous waste site investigations. Doll, W.E. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.); Miller, R.D.; Xia, J. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 64. annual meeting of the Society of Exploration Geophysicists and international exposition; Los Angeles, CA (United States); 23-27 Oct 1994. Order Number DE95010299. Source: OSTI; NTIS; INIS; GPO Dep.

Many commonly used shallow seismic sources are unacceptable for hazardous waste site investigations because they risk exhumation of contaminants in the soil, they add contaminants (e.g. lead) which are not allowed by regulations, or they add new migration paths for contaminants. Furthermore, recently developed high frequency vibrators for shallow investigations could be more effective at some sites than non-invasive impulsive sources because of their ability to tailor the source spectrum and reduce interference. The authors show preliminary results of a comparison test of eight non-invasive impulsive and swept sources in preparation for seismic reflection profiling on the Oak Ridge Reservation, Tennessee. Well log data are used to determine geologic contacts and to generate synthetic seismograms for the site. Common midpoint (CMP) seismic data for each source were collected at 95 geophone groups from 125 shot points along a 400m test line. Hydrophone data were obtained at 1.5m spacing between 61m and 133m depth in a hole near the center of the CMP line. As of March, 1994, brute stacks have been completed for three of the eight sources. Depth penetration is demonstrated in brute stacks and shot gathers, which show a 200ms reflector for all of the sources tested along portions of the line. Source effectiveness will also be evaluated by comparing images of several shallower reflectors (40-150ms) which are apparent in many of the records. Imaging of these reflectors appears to depend upon the ability of the source to generate sufficient high frequency energy (>100 Hz).

453 (CONF-9410230-2) Sampling of resident earthworms using mustard expellant to evaluate ecological risk at a mixed hazardous and radioactive waste site. Stair, D.M. Jr. (Bechtel Environmental Inc., Oak Ridge, TN (United States). Oak Ridge Remediation Center); Keller, L.J.; Hensel, T.W. Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. annual conference on contaminated soils, analysis, fate, environmental and public health effects, remediation and regulation; Amherst, MA (United States); 17-20 Oct 1994. Order Number DE95010287. Source: OSTI; NTIS; INIS; GPO Dep.

As residents of contaminated soils and as prey for many species of wildlife, earthworms can serve as integrative biomonitors of soil contamination, which is biologically available to the terrestrial food chain. The assessment of contaminants within earthworm tissue provides a more realistic measurement of the potential biological hazards and ecological risks than physical and chemical measurements of soil. A unique sampling procedure using a mixture of ground mustard powder and water was implemented for cost-effectively collecting earthworms without digging; the procedure minimized occupational exposure to soil contaminants and reduced the quantity of investigation-derived wastes. The study site is located at a closed burial ground for low-level radioactive waste and transuranic waste that lies within the Valley and Ridge Physiographic Province of East Tennessee. Earthworms were maintained in the laboratory for four days to allow passage of the contents of the digestive tract. Earthworm body burdens, castings, and soil were analyzed for gamma-emitting radioisotopes (potassium 40, cobalt 60, cesium 137), strontium 90, trace metals (arsenic, cadmium, chromium, mercury, lead, and selenium), and polychlorinated biphenyls (PCBs). Ecological effects of soil contamination on the earthworms were also assessed through analysis of weight, abundance, and reproductive success.

454 (CONF-941214-4) Performance assessment experience at Oak Ridge National Laboratory. Lee, D.W. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 16. US Department of Energy low-level radioactive waste management conference; Phoenix, AZ (United States); 13-15 Dec 1994. Order Number DE95008781. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a performance assessment (PA) for low-level radioactive waste disposal operations at Oak Ridge National Laboratory (ORNL) was initiated in 1989 and is continuing. A draft PA was prepared in September 1990 and submitted to the DOE Peer Review Panel for review and comment. Recommendations were received that formed the basis for a revised PA that was completed in December 1993. The review of the revised PA is continuing. This paper reviews the experience gained in the preparation of the PA including the technical difficulties associated with performance assessment in Oak Ridge and an overview of the methods used in the PA. Changes in waste operations that resulted from the findings in the PA include improved waste acceptance criteria, waste certification, and waste management practices. The discussion includes issues that relate to the application of current performance objectives to older disposal facilities, which are being addressed as part of the CERCLA process.

455 (CONF-950216-85) Mercury removal from liquid and solid mixed waste. Gates, D.D. (Oak Ridge National Lab., TN (United States)); Klasson, K.T.; Corder, S.L.; Cameron, P.A.; Perona, J.J.; Chao, K.K. Oak Ridge National Lab., TN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95009027. Source: OSTI; NTIS; INIS; GPO Dep.

Based on bench-scale laboratory experiments, the following conclusions were reached: Sulfur-impregnated, activated, carbon pellets (Mersorb) can be used to remove mercury (Hg^{2+}) to below EPA's toxic characteristic level (0.2 mg/L). Mersorb works under acid conditions (pH 2) but its capacity is reduced by approximately 50% compared with neutral conditions. Competing ions present in the target waste stream reduced the Mersorb capacity by 50%. Mersorb appears to be economical compared with leading ion exchange resin. KI/I_2 leaching solution can be used to remove up to 99% of Hg in contaminated soil and glass. KI/I_2 leaching solution worked well with several mercury species, including Hg^0 , HgO , HgS , and HgCl_2 . KI/I_2 leaching solution worked well with a wide variety of initial mercury concentrations. Radionuclide surrogate studies suggested that uranium will not partition into KI/I_2 leaching solutions. Cesium may partition into the KI/I_2 leaching solution because of the high solubility of cesium salts.

456 (CONF-950216-95) Integration of remediation strategy with waste management capabilities and regulatory drivers for radioactive waste storage tanks at the Oak Ridge National Laboratory. Baxter, J.T. (H&R Technical Associates, Inc., Oak Ridge, TN (United States)); Hepworth, H.K.; Hooyman, J.H. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95009174. Source: OSTI; NTIS; INIS; GPO Dep.

This paper addresses the plans and strategies for remediation of the Liquid Low-Level Waste (LLLW) system tanks that have been removed from service at the Oak Ridge National Laboratory (ORNL). The Superfund Amendments and Reauthorization Act of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a Federal Facility Agreement (FFA) for federal facilities placed on the National Priorities List. The Oak Ridge Reservation was placed on that list on December 21, 1989, and the agreement was signed in November 1991 by the U.S. Department of Energy Oak Ridge Operations Office (DOE-ORO), the EPA-Region IV, and the Tennessee Department of Environment and Conservation (TDEC). The effective date of the FFA is January 1, 1992. One requirement of the FFA is that LLLW tanks that are removed from service must be evaluated and remediated through the CERCLA process. The Environmental Restoration Program intends to meet this requirement by using a "streamlined" approach for selected tanks. This approach will combine the CERCLA Site Investigation, Remedial Action, Feasibility Study, and Proposed Plan requirements into a single Interim Proposed Plan document. This streamlined approach is expected to reduce the time required to complete the regulatory process while attaining acceptable risk reduction in a cost-effective way.

457 (CONF-950216-121) Washing techniques as an alternative to incineration. Dickerson, K.S. (Oak Ridge

National Lab., Grand Junction, CO (United States). Health Science Research Div.; Muhr, C.A.; Brown, C.H. Oak Ridge National Lab., TN (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95010217. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Protection Agency (EPA) best demonstrated available technology under the Resource Conservation and Recovery Act (RCRA) for many hazardous wastes is incineration. However, public pressure has caused state and federal regulators to consider tightening emission standards on incineration units. Accordingly, the US Department of Energy (DOE) Environmental Management (EM) and the Office of Technology Development are exploring alternatives to incineration to remediate the large amounts of existing hazardous and mixed waste. The purpose of this paper is to review washing technologies as an alternative to incineration. Soil washing is the extraction of contaminants from excavated soil by mixing the soil with water, solvents, surfactants, or chelating agents. Soil washing is a combination of physical and chemical treatments performed on soil in an aqueous solution. It is often used as a size segregation technique for washing fines from coarse soil. The process removes contaminants that reside in specific grain-size domains, separates the waste stream into "cuts", and focuses on treatment appropriate to the contaminant/grain-size relationship. Usually, heavily contaminated soils are treated several times in a multistage counter-current system. Contaminated water or solution generated during the soil washing process is treated for removal of contaminants. Current soil washing extraction solutions range from alkaline mixtures of ionic and nonionic surfactants and bioremediating agents to acid rinses. Additionally, washing processes may provide added benefit for treatment of low-level mixed waste debris through application of the debris rule.

458 (CONF-950216-125) Mixed Waste Integrated Program waste destruction/stabilization technical area program highlights. McFee, J. (IT Corp., Albuquerque, NM (United States)); Berry, J.B. Oak Ridge National Lab., TN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95010214. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Integrated Program was established to plan, manage, and integrate the US Department of Energy's mixed waste programs for research, development, demonstration, testing, and evaluation of innovative treatment technologies. The current status of the program is described including activities in process systems integration, regulatory interfacing, and development activities in the waste destruction and stabilization technical area. Technologies discussed include the plasma hearth process and steam reforming.

459 (CONF-950216-127) Phase 2 microwave concrete decontamination results. White, T.L.; Foster, D. Jr.; Wilson, C.T.; Schaich, C.R. Oak Ridge National Lab., TN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95010212. Source: OSTI; NTIS; INIS; GPO Dep.

The authors report on the results of the second phase of a four-phase program at Oak Ridge National Laboratory to develop a system to decontaminate concrete using microwave

energy. The microwave energy is directed at the concrete surface through the use of an optimized wave guide antenna, or applicator, and this energy rapidly heats the free water present in the interstitial spaces of the concrete matrix. The resulting steam pressure causes the surface to burst in much the same way popcorn pops in a home microwave oven. Each steam explosion removes several square centimeters of concrete surface that are collected by a highly integrated wave guide and vacuum system. The authors call this process the microwave concrete decontamination, or MCD, process. In the first phase of the program the principle of microwaves concrete removal concrete surfaces was demonstrated. In these experiments, concrete slabs were placed on a translator and moved beneath a stationary microwave system. The second phase demonstrated the ability to mobilize the technology to remove the surfaces from concrete floors. Area and volume concrete removal rates of 10.4 cm²/s and 4.9 cm³/s, respectively, at 18 GHz were demonstrated. These rates are more than double those obtained in Phase 1 of the program. Deeper contamination can be removed by using a longer residence time under the applicator to create multiple explosions in the same area or by taking multiple passes over previously removed areas. Both techniques have been successfully demonstrated. Small test sections of painted and oil-soaked concrete have also been removed in a single pass. Concrete with embedded metal anchors on the surface has also been removed, although with some increased variability of removal depth. Microwave leakage should not pose any operational hazard to personnel, since the observed leakage was much less than the regulatory standard.

460 (DOE/CH-9504) Development and testing of the Minimum Additive Waste Stabilization (MAWS) system for Fernald wastes. Phase 1, Final report. Fu, S.S. (GTS Duratek, Columbia, MD (United States)); Matlack, K.S.; Mohr, R.K.; Brandys, M. Hojaji, H.; Bennett, S.; Ruller, J.; Pegg, I.L. GTS Duratek, Columbia, MD (United States); Catholic Univ. of America, Washington, DC (United States). Vitreous State Lab. Dec 1994. 278p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. Order Number DE95008771. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents results of a treatability study for the evaluation of the MAWS process for wastes stored at the Fernald Environmental Management Project (FEMP) site. Wastes included in the study were FEMP Pit 5 sludges, soil-wash fractions, and ion exchange media from a water treatment system supporting a soil washing system. MAWS offers potential for treating a variety of waste streams to produce a more leach resistant waste form at a lower cost than, say, cement stabilization.

461 (DOE/CH/10575-T2) Application of modern diagnostic methods to environmental improvement. Annual progress report, January-October 1994. Shepard, W.S. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. Dec 1994. 193p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93CH10575. Order Number DE95005797. Source: OSTI; NTIS; INIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL), a research department in the College of Engineering at Mississippi State University (MSU), is under contract with the US Department of Energy (DOE) to develop and apply advanced diagnostic instrumentation and analysis techniques to real world processes; measurements are made in

hot, highly corrosive atmospheres in which conventional measurement devices are ineffective. Task 1 of this agreement is concerned with the development and application of various diagnostic methods to characterize the plasma properties, the melt properties and the downstream emissions from a plasma torch facility designed to vitrify mixed waste. Correlation of the measured properties with the operating parameters of the torch will be sought to improve, optimize and control the overall operation of the plasma treatment process. As part of this program, diagnostic methods will be developed and evaluated for characterization, monitoring and control purposes of treatment processes in general. Task 2 of this agreement is concerned with the development of a system to monitor and control the combustion stoichiometry in real time in order to minimize environmental impact and maximize process efficiency. Staged fuel injection is also being studied to minimize NO_x formation.

462 (DOE/EA-0843) Environmental Assessment Idaho National Engineering Laboratory, low-level and mixed waste processing. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Jun 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95006841. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) has prepared an environmental assessment (EA), DOE/EA-0843, for the Idaho National Engineering Laboratory (INEL) low-level and mixed waste processing. The original proposed action, as reviewed in this EA, was (1) to incinerate INEL's mixed low-level waste (MLLW) at the Waste Experimental Reduction Facility (WERF); (2) reduce the volume of INEL generated low-level waste (LLW) through sizing, compaction, and stabilization at the WERF; and (3) to ship INEL LLW to a commercial incinerator for supplemental LLW volume reduction.

463 (DOE/EM-0089T-Rev.2) DOE methods for evaluating environmental and waste management samples. Goheen, S.C.; McCulloch, M.; Thomas, B.L.; Riley, R.G.; Sklarew, D.S.; Mong, G.M.; Fadeff, S.K. (eds.). Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 835p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL-7722-Rev.2). Order Number DE95004428. Source: OSTI; NTIS; INIS; GPO Dep.

DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods) is a resource intended to support sampling and analytical activities for the evaluation of environmental and waste management samples from U.S. Department of Energy (DOE) sites. DOE Methods is the result of extensive cooperation from all DOE analytical laboratories. All of these laboratories have contributed key information and provided technical reviews as well as significant moral support leading to the success of this document. DOE Methods is designed to encompass methods for collecting representative samples and for determining the radioisotope activity and organic and inorganic composition of a sample. These determinations will aid in defining the type and breadth of contamination and thus determine the extent of environmental restoration or waste management actions needed, as defined by the DOE, the U.S. Environmental Protection Agency, or others. The development of DOE Methods is supported by the Analytical Services Division of DOE. Unique methods or methods consolidated from similar procedures in the DOE Procedures

Database are selected for potential inclusion in this document. Initial selection is based largely on DOE needs and procedure applicability and completeness. Methods appearing in this document are one of two types, "Draft" or "Verified". "Draft" methods that have been reviewed internally and show potential for eventual verification are included in this document, but they have not been reviewed externally, and their precision and bias may not be known. "Verified" methods in DOE Methods have been reviewed by volunteers from various DOE sites and private corporations. These methods have delineated measures of precision and accuracy.

464 (DOE/EM-0148P) Uranium in Soils Integrated Demonstration: Technology summary, March 1994. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Mar 1994. 45p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94012510. Source: OSTI; NTIS; INIS; GPO Dep.

A recent Pacific Northwest Laboratory (PNL) study identified 59 waste sites at 14 DOE facilities across the nation that exhibit radionuclide contamination in excess of established limits. The rapid and efficient characterization of these sites, and the potentially contaminated regions that surround them represents a technological challenge with no existing solution. In particular, the past operations of uranium production and support facilities at several DOE sites have occasionally resulted in the local contamination of surface and subsurface soils. Such contamination commonly occurs within waste burial sites, cribs, pond bottom sediments and soils surrounding waste tanks or uranium scrap, ore, tailings, and slag heaps. The objective of the Uranium In Soils Integrated Demonstration is to develop optimal remediation methods for soils contaminated with radionuclides, principally uranium (U), at DOE sites. It is examining all phases involved in an actual cleanup, including all regulatory and permitting requirements, to expedite selection and implementation of the best technologies that show immediate and long-term effectiveness specific to the Fernald Environmental Management Project (FEMP) and applicable to other radionuclide contaminated DOE sites. The demonstration provides for technical performance evaluations and comparisons of different developmental technologies at FEMP sites, based on cost-effectiveness, risk-reduction effectiveness, technology effectiveness, and regulatory and public acceptability. Technology groups being evaluated include physical and chemical contaminant separations, in situ remediation, real-time characterization and monitoring, precise excavation, site restoration, secondary waste treatment, and soil waste stabilization.

465 (DOE/EM-0172P) Idaho Operations Office: Technology summary, June 1994. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Jun 1994. 109p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014933. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared by the Department of Energy's (DOE) Environmental Management (EM) Office of Technology Development (OTD) in order to highlight research, development, demonstration, testing, and evaluation (RDDT&E) activities funded through the Idaho Operations Office. Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US industry's competitiveness in global environmental markets. OTD programs are designed

to make new, innovative, and more cost-effective technologies available for transfer to DOE environmental restoration and waste management end-users. Projects are demonstrated, tested, and evaluated to produce solutions to current problems. Transition of technologies into more advanced stages of development is based upon technological, regulatory, economic, and institutional criteria. New technologies are made available for use in eliminating radioactive, hazardous, and other wastes in compliance with regulatory mandates. The primary goal is to protect human health and prevent further contamination. OTD's technology development programs address three major problem areas: (1) groundwater and soils cleanup; (2) waste retrieval and processing; and (3) pollution prevention. These problems are not unique to DOE, but are associated with other Federal agency and industry sites as well. Thus, technical solutions developed within OTD programs will benefit DOE, and should have direct applications in outside markets.

466 (DOE/EM-0191P) Summary of expenditures of rebates from the low-level radioactive waste surcharge escrow account for calendar year 1993: Report to Congress. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Jun 1994. 16p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018398. Source: OSTI; NTIS; INIS; GPO Dep.

This is the eighth report submitted to Congress in accordance with section 5(d)(2)(E)(ii)(II) of the Low-Level Radioactive Waste Policy Act (the Act). This section of the Act directs the Department of Energy (DOE) to summarize the annual expenditures of funds disbursed from the DOE surcharge escrow account and to assess compliance of these expenditures with the following limitations specified in the Act: establish low-level radioactive waste disposal facilities; mitigate the impact of low-level radioactive waste disposal facilities on the host State; regulate low-level radioactive waste disposal facilities; or ensure the decommissioning, closure, and care during the period of institutional control of low-level radioactive waste disposal facilities. In addition to placing these limitations on the use of these funds, the Act also requires all nonsited compact regions and nonmember States to provide DOE with an itemized report of their expenditures on December 31 of each year in which funds are expended. Within six months after receiving the individual reports, the Act requires the Secretary of Energy to furnish Congress with a summary of the reported expenditures and an assessment of compliance with the specified usage limitations. This report fulfills that requirement.

467 (DOE/EM-0192T) Morgantown Energy Technology Center, technology summary. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Jun 1994. 121p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018616. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared by the DOE Environmental Management (EM) Office of Technology Development (OTD) to highlight its research, development, demonstration, testing, and evaluation activities funded through the Morgantown Energy Technology Center (METC). Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US industry's competitiveness in global environmental markets. METC's R&D programs are focused on commercialization of technologies

that will be carried out in the private sector. META has solicited two PRDAs for EM. The first, in the area of groundwater and soil technologies, resulted in twenty-one contact awards to private sector and university technology developers. The second PRDA solicited novel decontamination and decommissioning technologies and resulted in eighteen contract awards. In addition to the PRDAs, METC solicited the first EM ROA in 1993. The ROA solicited research in a broad range of EM-related topics including in situ remediation, characterization, sensors, and monitoring technologies, efficient separation technologies, mixed waste treatment technologies, and robotics. This document describes these technology development activities.

468 (DOE/EM-0200) Albuquerque Operations Office, Albuquerque, New Mexico: Technology summary. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Aug 1994. 213p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002324. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared by the Department of Energy's (DOE) Environmental Management (EM) Office of Technology Development (OTD) in order to highlight research, development, demonstration, testing, and evaluation (RDDT&E) activities funded through the Albuquerque Operations Office. Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US industry's competitiveness in global environmental markets. The information has been assembled from recently produced OTD documents that highlight technology development activities within each of the OTD program elements. These integrated program summaries include: Volatile Organic Compounds in Non-Arid Soils, Volatile Organic Compounds in Arid Soils, Mixed Waste Landfill Integrated Demonstration, Uranium in Soils Integrated Demonstration, Characterization, Monitoring, and Sensor Technology, In Situ Remediation, Buried Waste Integrated Demonstration, Underground Storage Tank, Efficient Separations and Processing, Mixed Waste Integrated Program, Rocky Flats Compliance Program, Pollution Prevention Program, Innovation Investment Area, and Robotics Technology.

469 (DOE/EM-0224) Summary report of a workshop on phytoremediation research needs. USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Dec 1994. 24p. Sponsored by USDOE, Washington, DC (United States). (CONF-9407155-Summ.: Workshop on phytoremediation research needs, Santa Rosa, CA (United States), 24-26 Jul 1994). Order Number DE95006076. Source: OSTI; NTIS; INIS; GPO Dep.

Soil contamination is a national and global problem. A major challenge is the remediation of large sites contaminated with radionuclides and toxic metals, often present in relatively small amounts but above regulatory action levels. Despite the function of phytoremediation processes in nature for millennia, the technology of phytoremediation is, for the most part, still a concept. There are many different pollutants, plant uptake mechanisms, soil matrices, and plant species that need to be investigated, without overlooking the microbial participation in this technology. Developing actual practical applications will require a significant and coordinated research and development effort, due to the complexity of both biological systems and the soil contamination problems. Research and development in this area

must involve scientists and engineers in Federal and state agencies, foreign organizations and industry. The representation at the workshop of researchers from many disciplines, organizations and countries, augurs well for a cooperative and interdisciplinary research effort and the rapid application of this technology. The urgent needs for effective, low-cost technologies to clean-up contaminated soils, both in the US and around the world, suggests phytoremediation as a high national and international research priority. The availability of scientists trained in the interdisciplinary topics relating to phytoremediation will be a major factor in expediting development of this technology.

470 (DOE/ER/54235-1) Decomposition of chlorinated organic compounds in gaseous hazardous waste using a tunable plasma reactor. Koch, M. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. ©Mar 1994. 361p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-94ER54235. Source: Massachusetts Institute of Technology, Plasma Fusion Center, Cambridge, Massachusetts 02139.

An experimental investigation was performed of the Cold Plasma Decomposition (CPD) of the chlorinated methanes CCl_4 (Tetrachloro Methane) and CHCl_3 (Trichloro Methane) and the chlorinated ethene C_2HCl_3 (Trichloro Ethene) in gaseous hazardous waste using a Tunable Plasma Reactor (TPR). The cold plasma in this reactor was generated by an electron beam. The electron and radical concentration of the cold plasma was controlled through the electron beam current, the average electron energy of the cold plasma was controlled through the sub-breakdown electric field voltage superimposed to the electron beam. The decomposition of CCl_4 in dry air and wet air was found to result in the formation of CO , CO_2 , HCl and Cl_2 as stable decomposition products and COCl_2 (Carbonyl Chloride) as an intermediate decomposition product. The decomposition of COCl_2 to sub ppm levels required a comparable electron beam dose as the decomposition of CCl_4 to sub ppm levels. The decomposition of C_2HCl_3 in dry and wet air was found to result in the formation of HCl and Cl_2 as stable decomposition products and $\text{C}_2\text{HCl}_3\text{O}$ (Dichloro Acetyl Chloride) as intermediate decomposition products. No chemical analysis was performed for the formation of CO and CO_2 . The decomposition of $\text{C}_2\text{HCl}_3\text{O}$ and COCl_2 to sub ppm levels required a ten to hundred times higher electron beam dose than the decomposition of the C_2HCl_3 to sub ppm levels. At a destruction and removal efficiency of higher than 99%, the energy expense for CCl_4 CPD in dry air was found to be less than 150 eV per CCl_4 molecule decomposed or 25 kWh/kg of CCl_4 decomposed. These values were found to apply independently of the CCl_4 intake concentration. The CPD of CCl_4 in a TPR may be achieved at substantially lower operational cost than the customary Flame Decomposition, which, at a CCl_4 intake concentration of lower than 500 ppm, requires more than 600 eV or 100 kWh/kg, respectively.

471 (DOE/ID-10057(93)) Idaho National Engineering Laboratory Nonradiological Waste Management Information for 1993 and record to date. Sims, A.M.; Taylor, K.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002025. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides detailed data and graphics on airborne and liquid effluent releases, fuel oil and coal consumption, water usage, and hazardous and mixed waste

generated for calendar year 1993. This report summarizes industrial waste data records compiled since 1971 for the Idaho National Engineering Laboratory (INEL). The data presented are from the INEL Nonradiological Waste Management Information System.

472 (DOE/ID/12735-T30) Projects at the Component Development and Integration Facility: Quarterly technical progress report, 1 October-31 December 1993. MSE, Inc., Butte, MT (United States). [1993]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE94014158. Source: OSTI; NTIS; GPO Dep.

This quarterly technical progress report presents progress on the projects at the Component Development and Integration Facility (CDIF) during the first quarter of FY94. The CDIF is a major US Department of Energy test facility in Butte, Montana, operated by MSE, Inc. Projects in progress include: Biomass Remediation Project; MHD Shutdown; Mine Waste Technology Pilot Program; Plasma Projects; Resource Recovery Project; Sodium Sulfide/Ferrous Sulfate Project; Heavy Metal-Contaminated Soil Project; and Spray Casting Project. Each project is briefly described along with technical accomplishments, major events, and projected activities.

473 (DOE/ID/12735-T31) Projects at the Component Development and Integration Facility: Quarterly technical progress report, January 1, 1994-March 31, 1994. MSE, Inc., Butte, MT (United States). [1994]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE94017038. Source: OSTI; NTIS; GPO Dep.

This quarterly technical progress report presents progress on the projects at the Component Development and Integration Facility (CDIF) during the second quarter of FY94. The CDIF is a major US Department of Energy test facility in Butte, Montana, operated by MSE, Inc. Projects in progress include: Biomass Remediation Project; Heavy Metal-Contaminated Soil Project; MHD Shutdown; Mine Waste Technology Pilot Program; Plasma Projects; Resource Recovery Project; Sodium Sulfide/Ferrous Sulfate Project; and Spray Casting Project.

474 (DOE/ID/12735-T34) Projects at the Western Environmental Technology Office. Quarterly technical progress report, October 1-December 31, 1994. MSE, Inc., Butte, MT (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE95007651. Source: OSTI; NTIS; GPO Dep.

Effective October 1, 1994, the Component Development and Integration Facility (CDIF) formally became the Western Environmental Technology Office (WETO). This name change followed an April 6, 1994, announcement from Assistant Secretary for Environmental Restoration and Waste Management at the Department of Energy (DOE), Thomas Grumbly, that the facility would be given the new role of researching ways to clean up environmental contamination. Accompanying the name change and the new role of environmental cleanup, the facility was placed under the direction of the DOE's Environmental Management Office. This quarterly technical progress report presents progress on projects at WETO during the first quarter of FY95. WETO is operated by MSE, Inc., in Butte, Montana. Projects in progress include: Biomass Remediation Project; Heavy Metal-Contaminated Soil Project; MHD Shutdown; Mine

Waste Technology Program; Plasma Projects; Resource Recovery Project; Spray Casting Project; and Watervliet Arsenal Project.

475 (DOE/ID/13042-37) **Hydrogeology, waste disposal, science and politics: Proceedings.** Link, P.K. (ed.). Idaho State Government, Boise, ID (United States). 1994. 652p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-91ID13042. (CONF-9403128--: Hydrogeology, waste disposal, science and politics: 30. symposium on engineering geology and geotechnical engineering, Boise, ID (United States), 23-25 Mar 1994). Order Number DE94014144. Source: OSTI; NTIS; INIS; GPO Dep.

A total of 48 papers were presented at the Engineering Geology and Geotechnical Engineering 30th Symposium. These papers are presented in this proceedings under the following headings: site characterization-Pocatello area; site characterization-Boise Area; site assessment; Idaho National Engineering Laboratory; geophysical methods; remediation; geotechnical engineering; and hydrogeology, northern and western Idaho. Individual papers have been processed separately for inclusion in the Energy Science and Technology Database.

476 (DOE/ID/13220-T2) **Magnetically controlled deposition of metals using gas plasma. Quarterly progress report, July 1994-September 1994.** Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE95003827. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports the status of grant DE-FE07-93ID13220 for the July-September, 1994 quarter. The objective of this grant is to develop a method of spraying materials on a substrate in a controlled manner to eliminate the waste inherent in the present process. Thin layers of secondary material are plated on substrates either by plating or spraying processes. Plating operations produce large amounts of hazardous liquid waste. Spraying, while one of the less waste intensive methods, produces 'over spray' which is waste that is a result of the uncontrolled nature of the spray stream. In many cases the over spray produces a hazardous waste.

477 (DOE/LLW-103-Rev.1) **Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-94060). Order Number DE95001911. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a history of commercial low-level radioactive waste disposal in the United States, with emphasis on the history of six commercially operated low-level radioactive waste disposal facilities. The report includes a brief description of important steps that have been taken during the last decade to ensure the safe disposal of low-level radioactive waste in the 1990s and beyond. These steps include the issuance of comprehensive State and Federal regulations governing the disposal of low-level radioactive waste, and the enactment of Federal laws making States responsible for the disposal of such waste generated within their borders.

478 (DOE/LLW-114-Rev.1) **Greater-than-Class C low-level radioactive waste characterization: Estimated volumes, radionuclide activities, and other characteristics.** Revision 1. EG and G Idaho, Inc., Idaho Falls, ID

(United States). Sep 1994. 772p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95004982. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE's) planning for the disposal of greater-than-Class C low-level radioactive waste (GTCC LLW) requires characterization of the waste. This report estimates volumes, radionuclide activities, and waste forms of GTCC LLW to the year 2035. It groups the waste into four categories, representative of the type of generator or holder of the waste: Nuclear Utilities, Sealed Sources, DOE-Held, and Other Generator. GTCC LLW includes activated metals (activation hardware from reactor operation and decommissioning), process wastes (i.e., resins, filters, etc.), sealed sources, and other wastes routinely generated by users of radioactive material. Estimates reflect the possible effect that packaging and concentration averaging may have on the total volume of GTCC LLW. Possible GTCC mixed LLW is also addressed. Nuclear utilities will probably generate the largest future volume of GTCC LLW with 65-83% of the total volume. The other generators will generate 17-23% of the waste volume, while GTCC sealed sources are expected to contribute 1-12%. A legal review of DOE's obligations indicates that the current DOE-Held wastes described in this report will not require management as GTCC LLW because of the contractual circumstances under which they were accepted for storage. This report concludes that the volume of GTCC LLW should not pose a significant management problem from a scientific or technical standpoint. The projected volume is small enough to indicate that a dedicated GTCC LLW disposal facility may not be justified. Instead, co-disposal with other waste types is being considered as an option.

479 (DOE/LLW-126) **National Low-Level Waste Management Program Radionuclide Report Series. Volume 10, Nickel-63.** Carboneau, M.L.; Adams, J.P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008568. Source: OSTI; NTIS; INIS; GPO Dep.

This report outlines the basic radiological, chemical, and physical characteristics of nickel-63 (^{63}Ni) and examines how these characteristics affect the behavior of ^{63}Ni in various environmental media, such as soils, groundwater, plants, animals, the atmosphere, and the human body. Discussions also include methods of ^{63}Ni production, waste types, and waste forms that contain ^{63}Ni . The primary source of ^{63}Ni in the environment has been low-level radioactive waste material generated as a result of neutron activation of stable ^{62}Ni that is present in the structural components of nuclear reactor vessels. ^{63}Ni enters the environment from the dismantling activities associated with nuclear reactor decommissioning. However, small amounts of ^{63}Ni have been detected in the environment following the testing of thermonuclear weapons in the South Pacific. Concentrations as high as 2.7 Bq/g per gram of sample (or equivalently 0.0022 parts per billion) were observed on Bikini Atoll (May 1954). ^{63}Ni was not created as a fission product species (e.g., from ^{235}U or ^{239}Pu fissions), but instead was produced as a result of neutron capture in ^{63}Ni , a common nickel isotope present in the stainless steel components of nuclear weapons (e.g., stainless-304 contains ~9% total Ni or ~0.3% ^{63}Ni).

480 (DOE/LLW-139) **A process for establishing a financial assurance plan for LLW disposal facilities.**

Smith, P. (EG and G Idaho, Inc., Idaho Falls, ID (United States). National Low-Level Waste Management Program). EG and G Idaho, Inc., Idaho Falls, ID (United States). National Low-Level Waste Management Program; Rogers and Associates Engineering Corp., Salt Lake City, UT (United States). Apr 1993. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-92024). Order Number DE95001927. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a process by which an effective financial assurance program can be developed for new low-level radioactive waste (LLW) disposal facilities. The report identifies examples of activities that might cause financial losses and the types of losses they might create, discusses mechanisms that could be used to quantify and ensure against the various types of potential losses identified and describes a decision process to formulate a financial assurance program that takes into account the characteristics of both the potential losses and available mechanisms. A sample application of the concepts described in the report is provided.

481 (DOE/LLW-157-Rev.1) **Performance assessment task team progress report.** Wood, D.E. (and others); Curl, R.U.; Armstrong, D.R.; Cook, J.R.; Dolenc, M.R.; Kocher, D.C.; Owens, K.W.; Regnier, E.P.; Roles, G.W.; Seitz, R.R. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1994. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002045. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Headquarters EM-35, established a Performance Assessment Task Team (referred to as the Team) to integrate the activities of the sites that are preparing performance assessments (PAs) for disposal of new low-level waste, as required by Chapter III of DOE Order 5820.2A, "Low-Level Waste Management". The intent of the Team is to achieve a degree of consistency among these PAs as the analyses proceed at the disposal sites. The Team's purpose is to recommend policy and guidance to the DOE on issues that impact the PAs, including release scenarios and parameters, so that the approaches are as consistent as possible across the DOE complex. The Team has identified issues requiring attention and developed discussion papers for those issues. Some issues have been completed, and the recommendations are provided in this document. Other issues are still being discussed, and the status summaries are provided in this document. A major initiative was to establish a subteam to develop a set of test scenarios and parameters for benchmarking codes in use at the various sites. The activities of the Team are reported here through December 1993.

482 (DOE/LLW-163-Vol.1) **Characterization of Greater-Than-Class C sealed sources. Volume 1, Sealed sources held by specific licensees.** Harris, G. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95008609. Source: OSTI; NTIS; INIS; GPO Dep.

Sealed sources are small, relatively high-activity radioactive sources typically encapsulated in a metallic container. The activities can range from less than 1 mCi to over 1,000 Ci. They are used in a variety of industries and are commonly available. Many of the sources will be classified as Greater-Than-Class C low-level radioactive waste (GTCC LLW) for the purpose of waste disposal. The US Department

of Energy is responsible for disposing of this class of low-level radioactive waste. To better understand the scope of the GTCC LLW situation regarding sealed sources and to provide data to a model that projects future quantities of GTCC material, data from a comprehensive 1991 US Nuclear Regulatory Commission (NRC) survey and a related 1992 survey of Agreement States were analyzed to estimate the number, volume, and activity of Potential GTCC sealed sources currently available from specific licensees. Potential GTCC sealed sources are sources that exceed the limits stated in 10 CFR 61 when isotope concentrations are averaged over the volume of the capsule. Based on the surveys, the estimated number of existing Potential GTCC sealed sources held by specific licensees is 89,000, with an unpackaged volume of 0.93 m³ and an activity of 2,300,000 Ci. However, current disposal practices allow concentration averaging over the disposal container, substantially reducing the number of sealed sources which will actually be classified as GTCC LLW.

483 (DOE/LLW-163-Vol.2) **Characterization of Greater-Than-Class C sealed sources. Volume 2, Sealed source characterization and future production.** Harris, G.; Griffel, A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95008610. Source: OSTI; NTIS; INIS; GPO Dep.

Sealed sources are small, relatively high-activity radioactive sources typically encapsulated in a metallic container. The activities can range from less than 1 mCi to over 1,000 Ci. They are used in a variety of industries and are commonly available. Many of the sources will be classified as Greater-Than-Class C low-level radioactive waste (GTCC LLW) for the purpose of waste disposal. The US Department of Energy is responsible for disposing of this class of low-level radioactive waste. The characterization of a sealed source is essentially a function of the type of radiation it emits, the principal use for which it is applied, and the activity it contains. The types of radiation of most interest to the GTCC LLW Program are gamma rays and neutrons, since these are emitted by the highest activity sources. The principal uses of most importance are gamma irradiators, medical teletherapy, well logging probes, and other general neutron applications. Current annual production rates of potential Greater-Than-Class C (PGTCC) sources sold to specific licensees were estimated based on data collected from device manufacturers. These estimates were then adjusted for current trends in the industry to estimate future annual production rates. It is expected that there will be approximately 8,000 PGTCC sealed sources produced annually for specific licensees.

484 (DOE/LLW-163-Vol.3) **Characterization of Greater-Than-Class C sealed sources. Volume 3, Sealed sources held by general licensees.** Harris, G. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95008611. Source: OSTI; NTIS; INIS; GPO Dep.

This is the third volume in a series of three volumes characterizing the population of sealed sources that may become greater-than-Class C low-level radioactive waste (GTCC LLW). In this volume, those sources possessed by general licensees are discussed. General-licensed devices may contain sealed sources with significant amounts of radioactive material. However, the devices are designed to be

safe to use without special knowledge of radiological safety practices. Devices containing Am-241 or Cm-244 sources are most likely to become GTCC LLW after concentration averaging. This study estimates that there are about 16,000 GTCC devices held by general licensees; 15,000 of these contain Am-241 sources and 1,000 contain Cm-244 sources. Additionally, this study estimates that there are 1,600 GTCC devices sold to general licensees each year. However, due to a lack of available information on general licensees in Agreement States, these estimates are uncertain. This uncertainty is quantified in the low and high case estimates given in this report, which span approximately an order of magnitude.

485 (DOE/LLW-188) Benchmarking of computer codes and approaches for modeling exposure scenarios. Seitz, R.R. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Rittmann, P.D.; Wood, M.I.; Cook, J.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-94062). Order Number DE95001978. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy Headquarters established a performance assessment task team (PATT) to integrate the activities of DOE sites that are preparing performance assessments for the disposal of newly generated low-level waste. The PATT chartered a subteam with the task of comparing computer codes and exposure scenarios used for dose calculations in performance assessments. This report documents the efforts of the subteam. Computer codes considered in the comparison include GENII, PATHRAE-EPA, MICROSHIELD, and ISOSHLD. Calculations were also conducted using spreadsheets to provide a comparison at the most fundamental level. Calculations and modeling approaches are compared for unit radionuclide concentrations in water and soil for the ingestion, inhalation, and external dose pathways. Over 30 tables comparing inputs and results are provided.

486 (DOE/LLW-195) RCRA designation of discarded americium/beryllium sealed sources. Kirner, N.P. (Ebasco Environmental, Idaho Falls, ID (United States)). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); Ebasco Environmental, Idaho Falls, ID (United States). Sep 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008619. Source: OSTI; NTIS; INIS; GPO Dep.

Many sealed sources containing americium and beryllium are used throughout construction, industry, and research, and will eventually require disposal. For planning purposes it is necessary to determine whether these sources, when disposed, constitute a mixed waste, i.e., a waste containing hazardous constituents regulated under the Resource Conservation and Recovery Act and radioactive constituents regulated under the Atomic Energy Act. Waste designation criteria contained in 40 CFR 261 are evaluated in detail in this report. It is determined that discarded americium/beryllium sealed sources do not contain any wastes listed in Subpart D of 40 CFR 261, nor do the discarded sources exhibit any hazardous characteristics. Therefore, it is concluded that discarded americium/beryllium sealed sources are not a mixed waste under regulations established by the US Environmental Protection Agency. Hazardous waste regulatory programs delegated to States, however, may have regulations that differ from those of the Federal government.

487 (DOE/LLW-203) Department of Energy treatment capabilities for greater-than-Class C low-level radioactive waste. Morrell, D.K.; Fischer, D.K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (INEL/MISC-94087). Order Number DE95008571. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides brief profiles for 26 low-level and high-level waste treatment capabilities available at the Idaho National Engineering Laboratory (INEL), Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), Oak Ridge National Laboratory (ORNL), Pacific Northwest Laboratory (PNL), Rocky Flats Plant (RFP), Savannah River Site (SRS), and West Valley Demonstration Plant (WVDP). Six of the treatments have potential use for greater-than-Class C low-level waste (GTCC LLW). They include: (a) the glass ceramic process and (b) the Waste Experimental Reduction Facility incinerator at INEL; (c) the Super Compaction and Repackaging Facility and (d) microwave melting solidification at RFP; (e) the vitrification plant at SRS; and (f) the vitrification plant at WVDP. No individual treatment has the capability to treat all GTCC LLW streams. It is recommended that complete physical and chemical characterizations be performed for each GTCC waste stream, to permit using multiple treatments for GTCC LLW.

488 (DOE/LLW-204) Technical survey of DOE programs and facilities applicable to the co-storage of commercial greater-than-Class C Low-Level Radioactive Waste and DOE special Case Waste. Allred, W.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008567. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents information on those US Department of Energy (DOE) management programs and facilities, existing and planned, that are potentially capable of storing DOE Special Case Waste (SCW) until a disposal capability is available. Major emphasis is given to the possibility of storing commercial greater-than-Class C low-level radioactive waste (GTCC LLW) together with DOE SCW, as well as with other waste types. In addition to this primary issue, the report gives an in-depth background on SCW and GTCC LLW, and discusses their similarities. Institutional issues concerning these waste types are not addressed in this report.

489 (DOE/LLW-205) 1993 State-by-state assessment of low-level radioactive wastes received at commercial disposal sites. Fuchs, R.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95003309. Source: OSTI; NTIS; INIS; GPO Dep.

Each year the National Low-Level Waste Management Program publishes a state-by-state assessment report. This report provides both national and state-specific disposal data on low-level radioactive waste commercially disposed in the United States. Data in this report are categorized according to disposal site, generator category, waste class, volumes, and radionuclide activity. Included in this report are tables showing the distribution of waste by state for 1993 and a comparison of waste volumes and radioactivity by state for 1989 through 1993; also included is a list of all commercial nuclear power reactors in the United States as of December

31, 1993. This report distinguishes between low-level radioactive waste shipped directly for disposal by generators and waste that was handled by an intermediary, a reporting change introduced in the 1988 state-by-state report.

490 (DOE/LLW-206) Model tracking system for low-level radioactive waste disposal facilities: License application interrogatories and responses. Benbennick, M.E.; Broton, M.S.; Fuoto, J.S.; Novgrod, R.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-94058). Order Number DE95002013. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a model tracking system for a low-level radioactive waste (LLW) disposal facility license application. In particular, the model tracks interrogatories (questions, requests for information, comments) and responses. A set of requirements and desired features for the model tracking system was developed, including required structure and computer screens. Nine tracking systems were then reviewed against the model system requirements and only two were found to meet all requirements. Using Kepner-Tregoe decision analysis, a model tracking system was selected.

491 (DOE/LLW-207) Use of engineered soils and other site modifications for low-level radioactive waste disposal. EG and G Idaho, Inc., Idaho Falls, ID (United States); International Technology Corp., Albuquerque, NM (United States). Aug 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-94059). Order Number DE95002014. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Nuclear Regulatory Commission requires that low-level radioactive waste (LLW) disposal facilities be designed to minimize contact between waste and infiltrating water through the use of site design features. The purpose of this investigation is to identify engineered barriers and evaluate their ability to enhance the long-term performance of an LLW disposal facility. Previously used barriers such as concrete overpacks, vaults, backfill, and engineered soil covers, are evaluated as well as state-of-the-art barriers, including an engineered sorptive soil layer underlying a facility and an advanced design soil cover incorporating a double-capillary layer. The purpose of this investigation is also to provide information in incorporating or excluding specific engineered barriers as part of new disposal facility designs. Evaluations are performed using performance assessment modeling techniques. A generic reference disposal facility design is used as a baseline for comparing the improvements in long-term performance offered by designs incorporating engineered barriers in generic and humid environments. These evaluations simulate water infiltration through the facility, waste leaching, radionuclide transport through the facility, and decay and ingrowth. They also calculate a maximum (peak annual) dose for each disposal system design. A relative dose reduction factor is calculated for each design evaluated. The results of this investigation are presented for concrete overpacks, concrete vaults, sorptive backfill, sorptive engineered soil underlying the facility, and sloped engineered soil covers using a single-capillary barrier and a double-capillary barrier. Designs using combinations of barriers are also evaluated. These designs include a vault plus overpacks, sorptive backfill plus overpacks, and overpack with vault plus sorptive backfill, underlying sorptive soil, and engineered soil cover.

492 (DOE/LLW-212) INEL storage facility for sealed sources from the commercial sector. Kingsford, C.O.; Satterthwaite, B.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-94064). Order Number DE95002044. Source: OSTI; NTIS; INIS; GPO Dep.

Commercially owned sealed radiation sources determine by the US Nuclear Regulatory Commission to be a public health or safety hazard are accepted by the US Department of Energy, under the Atomic Energy Act of 1954, as material for reuse or recycle. To implement this policy, the sealed sources must be stored until proper disposition is determined. This report documents the investigation and selection process undertaken to locate a suitable storage facility at the Idaho National Engineering Laboratory.

493 (DOE/LLW-217) DOE Waste Treatability Group Guidance. Kirkpatrick, T.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). Jan 1995. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008570. Source: OSTI; NTIS; INIS; GPO Dep.

This guidance presents a method and definitions for aggregating U.S. Department of Energy (DOE) waste into streams and treatability groups based on characteristic parameters that influence waste management technology needs. Adaptable to all DOE waste types (i.e., radioactive waste, hazardous waste, mixed waste, sanitary waste), the guidance establishes categories and definitions that reflect variations within the radiological, matrix (e.g., bulk physical/chemical form), and regulated contaminant characteristics of DOE waste. Beginning at the waste container level, the guidance presents a logical approach to implementing the characteristic parameter categories as part of the basis for defining waste streams and as the sole basis for assigning streams to treatability groups. Implementation of this guidance at each DOE site will facilitate the development of technically defined, site-specific waste stream data sets to support waste management planning and reporting activities. Consistent implementation at all of the sites will enable aggregation of the site-specific waste stream data sets into comparable national data sets to support these activities at a DOE complex-wide level.

494 (DOE/MC/28245-3909) Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994-June 30, 1994. Atomic Energy of Canada Ltd., Chalk River, ON (Canada). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28245. Order Number DE95002462. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to design and develop a physico-chemical treatment process for the removal of uranium and heavy metals from contaminated soil to achieve target contamination levels below 35 pCi/g of soil and a target for non-radioactive heavy metals below concentration levels permissible for release of the soil. The work will involve bench-scale and pilot-scale tests, using chelation-flotation, chemical leaching and ultrasonic leaching techniques, in conjunction with cross-flow microfiltration and filter-press operations. The effectiveness of an integrated process to treat leachates generated from soil processing will be demonstrated. Process flow-sheets suitable for in-situ and ex-situ applications will be developed and preliminary

costs will be provided for the soil and leachate treatment technologies.

495 (DOE/MC/28245-3922) Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants. Seventh quarterly technical progress report, July 1, 1994-September 30, 1994. Buckley, L.P. Atomic Energy of Canada Ltd., Chalk River, ON (Canada). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28245. Order Number DE95006153. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this project is to design and develop a physico-chemical treatment process for the removal of uranium and heavy metals from contaminated soil to achieve target contamination levels below 35 pCi/g of soil and a target for non-radioactive heavy metals below concentration levels permissible for release of the soil. The work will involve bench-scale and pilot-scale tests, using chelation-flotation, chemical leaching and ultrasonic leaching techniques, in conjunction with cross-flow microfiltration and filter-press operations. The effectiveness of an integrated process to treat leachates generated from soil processing will be demonstrated. Process flow-sheets suitable for in-situ and ex-situ applications will be developed and preliminary costs will be provided for the soil and leachate treatment technologies. The Task 2 Topical Report (milestone No. 4) summarizing contaminant removal results obtained from bench-scale studies using Fernald uranium soils and Chalk River Laboratories Chemical Pit soils was completed and issued on August 8, 1994. The results have shown that the soils containing uranium (about 400 pCi/g of soil) and strontium-90 (about 1200 pCi/g of soil) can be decontaminated to the target level of 35 pCi/g of treated soil in the presence of an ultrasonic field. Preliminary results obtained from the in-situ soil leaching tests are the average strontium-90 concentration in the cell was about 250 pCi/g; and the use of a dilute mineral acid (0.1 mol/L HCl) removed in excess of 85% of strontium-90 originally present in the soil.

496 (DOE/MC/29105-3719) Surrogate testing for the pilot VAC*TRAX™ unit. Chemical Waste Management, Inc., Anderson, SC (United States). Feb 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29105. Order Number DE94004107. Source: OSTI; NTIS; GPO Dep.

The project objective is to develop a mobile, economical process for treating organically contaminated soils, sediments, and sludges at sites with small contaminated soil volumes. VAC*TRAX treatment is a low temperature separation process that evaporates or volatilizes organic contaminants from soils, sludges, and other types of solid substances or wastes. It operates by heating the contaminated material in a nitrogen atmosphere in a jacketed vessel; hot oil is passed through the vessel jacket to supply heat to the system. To facilitate desorption, the dryer has the capability to operate at high vacuum, up to 94.6 kPa (28 in. Hg) vacuum. The nitrogen serves as an inert carrier gas for the volatilized organics, transporting them to the gas-treatment system, which consists of a condensing train followed by HEPA filter and activated carbon adsorption beds. The pilot testing operations conducted under the PRDA VAC*TRAX program were divided into two phases. The first involved a series of tests on mixed waste surrogate materials. Surrogates for mixed waste were defined as either soils spiked with representative RCRA regulated contaminants or RCRA regulated waste materials that are typical of or identical to mixed wastes but do not contain a

radioactive component. This test report presents the results of the surrogate waste testing. These tests were conducted under task 1.4 of the PRDA program.

497 (DOE/MC/29105-3970) VAC*TRAX vacuum thermal desorption. Clemson Technical Center, Inc., Anderson, SC (United States). Sep 1994. 344p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29105. Order Number DE95000054. Source: OSTI; NTIS; INIS; GPO Dep.

Pilot VAC*TRAX treatability tests were conducted on RCRA, TSCA, and RCRA/radioactive mixed wastes, to determine the efficiency in remediating organics' contaminated solids. The process volatilizes organic compounds by indirectly heating the feed material in a vacuum batch dryer and condensing the organics separately from the remaining solids. Contaminants included tetrachloroethene, bis(2-ethylhexyl)phthalate, pentachlorophenol, and PCBs. Treatment specifications were met: a tetrachloroethene removal >99.99% and PCB removal from a starting level of 990 ppM to a final level of <1 ppM. One test run was spiked with MoO₃, as a uranium simulant; the Mo remained in the treated solids, not transferring to the condensate. In the mixed waste tests, uranium present in a feed soil remained in the soil. Economic viability was demonstrated by achieving excellent treatment on a routine basis with both 4 and 6 hour heating cycles.

498 (DOE/MC/29107-94/C0341) Bench scale demonstration and conceptual engineering for DETOXSM catalyzed wet oxidation. Moslander, J.; Bell, R.; Robertson, D.; Dhooge, P.; Goldblatt, S. Delphi Research, Inc., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29107. (CONF-940815-28: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013665. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory and bench scale studies of the DETOXSM catalyzed wet oxidation process have been performed with the object of developing the process for treatment of hazardous and mixed wastes. Reaction orders, apparent rates, and activation energies have been determined for a range of organic waste surrogates. Reaction intermediates and products have been analyzed. Metals' fates have been determined. Bench scale units have been designed, fabricated, and tested with solid and liquid organic waste surrogates. Results from the laboratory and bench scale studies have been used to develop conceptual designs for application of the process to hazardous and mixed wastes.

499 (DOE/MC/29107-95/C0412) Engineering design and test plan for demonstrating DETOX treatment of mixed wastes. Goldblatt, S.; Dhooge, P. Delphi Research, Inc., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29107. (CONF-950216-56: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95007496. Source: OSTI; NTIS; INIS; GPO Dep.

DETOX is a cocatalyzed wet oxidation process in which the catalysts are a relatively great concentration of iron ions (typically as iron(III) chloride) in the presence of small amounts of platinum and ruthenium ions. Organic compounds are oxidized completely to carbon dioxide, water, and (if chlorinated) hydrogen chloride. The process has shown promise as a non-thermal alternative to incineration

for treatment and/or volume reduction of hazardous, radioactive, and mixed wastes. Design and fabrication of a demonstration unit capable of destroying 25. Kg/hr of organic material is now in progress. This paper describes the Title 2 design of the demonstration unit, and the planned demonstration effort at Savannah River Site (SRS) and Weldon Spring Site Remedial Action Project (WSSRAP).

500 (DOE/MC/29107-95/C0413) Development of a novel wet oxidation process for hazardous and mixed wastes. Dhooze, P.M. Delphi Research, Inc., Albuquerque, NM (United States). [1994]. 11p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC21-92MC29107. (CONF-9411149-10: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007568. Source: OSTI; NTIS; INIS; GPO Dep.

Many DOE waste streams and remediates contain complex and variable mixtures of organic compounds, toxic metals, and radionuclides. These materials are often dispersed in organic or inorganic matrices, such as personal protective equipment, various sludges, soils, and water. The over all objective of the effort described here is to develop a novel catalytic wet oxidation process for the treatment of these multi-component wastes, with the aim of providing a versatile, non-thermal method which will destroy hazardous organic compounds while simultaneously containing and concentrating toxic and radioactive metals for recovery or disposal in a readily stabilized matrix. The DETOX process uses a unique combination of metal catalysts to increase the rate of oxidation of organic materials. The metal catalysts are in the form of salts dissolved in a dilute acid solution. A typical catalyst composition is 60% ferric chloride, 3-4% hydrochloric acid, 0.13% platinum ions, and 0.13% ruthenium ions in a water solution. The catalyst solution is maintained at 423-473 K. Wastes are introduced into contact with the solution, where their organic portion is oxidized to carbon dioxide and water. If the organic portion is chlorinated, hydrogen chloride will be produced as a product. The process is a viable alternative to incineration for the treatment of organic mixed wastes. Estimated costs for waste treatment using the process are from \$2.50/kg to \$25.00/kg, depending on the size of the unit and the amount of waste processed. Process units can be mobile for on-site treatment of wastes. Results from phase 1 and 2, design and engineering studies, are described.

501 (DOE/MC/29109-95/C0431) Road Transportable Analytical Laboratory (RTAL) system. Finger, S.M. Engineering Computer Optoeconomics, Inc., Annapolis, MD (United States). [1995]. 11p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC21-92MC29109. (CONF-9411149-26: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95008948. Source: OSTI; NTIS; INIS; GPO Dep.

U.S. Department of Energy (DOE) facilities around the country have, over the years, become contaminated with radionuclides and a range of organic and inorganic wastes. Many of the DOE sites encompass large land areas and were originally sited in relatively unpopulated regions of the country to minimize risk to surrounding populations. In addition, wastes were sometimes stored underground at the sites in 55-gallon drums, wood boxes or other containers until final disposal methods could be determined. Over the years, these containers have deteriorated, releasing contaminants into the surrounding environment. This contamination

has spread, in some cases polluting extensive areas. The DOE would benefit greatly if it had reliable, road transportable, fully independent laboratory systems that could perform on-site the full range of analyses required. The goal of the Road Transportable Analytical Laboratory (RTAL) project is the development and demonstration of a system to meet the unique needs of the DOE for rapid, accurate analysis of a wide variety of hazardous and radioactive contaminants in soils, ground water and surface waters. This document describes the requirements for such a laboratory.

502 (DOE/MC/29109-3898) Road Transportable Analytical Laboratory (RTAL) System: Quarterly technical report, March 1993-May 1993. Engineering Computer Optoeconomics, Inc., Annapolis, MD (United States). 28 Jun 1993. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE95002509. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this contractual effort is the development and demonstration of a Road Transportable Analytical Laboratory (RTAL) system to meet the unique needs of the Department of Energy (DOE) for rapid, accurate analysis of a wide variety of hazardous and radioactive contaminants in soil, groundwater, and surface waters. This laboratory system will provide the field and laboratory analytical equipment necessary to detect and quantify radionuclides, organics, heavy metals and other inorganics, and explosive materials. The laboratory system consists of individual laboratory modules deployable independently or as an interconnected group to meet each DOE site's specific needs. Modules originally considered for inclusion in the system were: Radiochemistry Laboratory; Chemical Analysis Laboratory; Biomonitoring Laboratory; Field Analytical Instrument Laboratory; Robotic Sampler/Monitor Base Station; Decontamination Trailer; Operations Control Center; and Protected Living Quarters. However, after evaluating the needs of the DOE field activities and investigating alternative system designs, covered in this report, the modules included as part of the RTAL are: Radioanalytical Laboratory; Organic Chemical Analysis Laboratory; Inorganic Chemical Analysis Laboratory; Aquatic Biomonitoring Laboratory; Field Analytical Laboratory; Robotics Base Station; Decontamination/Sample Screening Module; Operations Control Center; and Protected Living Quarters.

503 (DOE/MC/29109-3977) Road Transportable Analytical Laboratory (RTAL) system. Quarterly progress report, February 1994-April 1994. Engineering Computer Optoeconomics, Inc., Annapolis, MD (United States). 15 Dec 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE95006218. Source: OSTI; NTIS; INIS; GPO Dep.

Progress on Phase 2 development of the RTAL system during the period February 1 through April 30, 1994 is reported.

504 (DOE/MC/29109-3978) Road Transportable Analytical Laboratory (RTAL) system. Quarterly progress report, May 1994-July 1994. Engineering Computer Optoeconomics, Inc., Annapolis, MD (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE95006217. Source: OSTI; NTIS; INIS; GPO Dep.

Progress achieved on the development of the RTAL system during the quarter, May 1 through July 31, 1994 is reported. The work included NEPA analysis, drawings,

prototype system construction, and on-site prototype demonstration.

505 (DOE/MC/29109-3979) **Road Transportable Analytical Laboratory (RTAL) system. Quarterly progress report, August 1994–October 1994.** Department of Energy, Morgantown, WV (United States). Morgantown Energy Technology Center. 15 Dec 1994. 6p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE95006208. Source: OSTI; NTIS; GPO Dep.

Goal is to develop and demonstrate a system for rapid, accurate analysis of a wide variety of hazardous and radioactive contaminants in soil, groundwater, and surface waters. More specifically, a road-transportable, fully independent laboratory system for on-site analyses is desired, for assisting DOE cleanup and remediation efforts. This report documents progress during the first quarterly period of Phase II. The RTAL system will be integrated into ECO's existing TERMM and TERMM modular systems.

506 (DOE/MC/29116-3799) **Novel mass spectrometric instrument for gaseous and particulate characterization and monitoring: Quarterly report, 1 October–31 December 1993.** Coggiola, M.J. SRI International, Menlo Park, CA (United States). Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29116. Order Number DE94014168. Source: OSTI; NTIS; INIS; GPO Dep.

SRI International will develop a unique new instrument that will be capable of providing real-time (<1 minute), quantitative, chemical characterization of gaseous and particulate pollutants generated from DOE waste cleanup activities. The instrument will be capable of detecting and identifying volatile organic compounds, polynuclear aromatic hydrocarbons, heavy metals, and transuranic species released during waste cleanup activities. The instrument will be unique in its ability to detect and quantify in real-time these diverse pollutants in both vapor and particulate form. The instrument to be developed under this program will consist of several major components: (1) an isokinetic sampler capable of operating over a wide range of temperatures (up to 500 K) and flow rates; (2) a high pressure to low pressure transition and sampling region that efficiently separates particles from vapor-phase components for separate, parallel analyses; (3) two small mass spectrometers, one optimized for organic analysis using a unique field ionization source and one optimized for particulate characterization using thermal pyrolysis and electron-impact ionization (EI); and (4) a powerful personal computer for control and data acquisition. Initially, the instrument will be developed for targeted use in conjunction with the K-1435 Toxic Substances Control Act (TSCA) incinerator at the Oak Ridge National Laboratory K-25 site. Ultimately, the instrument will be designed to operate in the field at any cleanup site, located close to the stack or process vent, providing the plant operations personnel with real-time information and alarm capabilities. In addition, this instrument will be very broadly applicable for cleanup or sampling, for example, any time contaminated soil is moved or disturbed.

507 (DOE/MC/29116-3858) **Novel mass spectrometric instrument for gaseous and particulate characterization and monitoring. Quarterly report, January 1, 1994–March 31, 1994.** Coggiola, M.J. SRI International, Menlo Park, CA (United States). May 1994. 15p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC21-92MC29116. Order Number DE94017588. Source: OSTI; NTIS; GPO Dep.

SRI International will develop a unique new instrument that will be capable of providing real-time (<1 minute), quantitative, chemical characterization of gaseous and particulate pollutants generated from DOE waste cleanup activities. The instrument will be capable of detecting and identifying volatile organic compounds, polynuclear aromatic hydrocarbons, heavy metals, and transuranic species released during waste cleanup activities. The instrument will be unique in its ability to detect and quantify in real-time these diverse pollutants in both vapor and particulate form. The instrument to be developed under this program will consist of several major components: (1) an isokinetic sampler capable of operating over a wide range of temperatures (up to 500 K) and flow rates; (2) a high pressure to low pressure transition and sampling region that efficiently separates particles from vapor-phase components for separate, parallel analyses; (3) two small mass spectrometers, one optimized for organic analysis using a unique field ionization source and one optimized for particulate characterization using thermal pyrolysis and electron-impact ionization (EI); and (4) a powerful personal computer for control and data acquisition.

508 (DOE/MC/29116-3913) **Novel mass spectrometric instrument for gaseous and particulate characterization and monitoring: Quarterly report, April 1, 1994–June 30, 1994.** Coggiola, M.J. SRI International, Menlo Park, CA (United States). Jul 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29116. Order Number DE95001135. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of the instrument is for real-time (<1 min), ppB analysis of gaseous/particulate pollutants (VOCs, PAHs, heavy metals, transuranics) from DOE waste cleanup. It will consist of an isokinetic sampler, a pressure transition and sampling region for parallel analyses, two small mass spectrometers (one for organic analysis using field ionization, one [ion trap] for particulates using pyrolysis and electron-impact ionization), and a personal computer. A dimethylsilicone membrane will be used for the organic vapors. A forward-backward coincidence method will be used in the laser scattering particle detector. The instrument will be easily transportable to DOE waste sites, such as waste storage tanks.

509 (DOE/MC/29116-3956) **Novel mass spectrometric instrument for gaseous and particulate characterization and monitoring. Final report, September 1992–August 1994.** Coggiola, M.J.; Becker, C.H.; Witham, C.L. SRI International, Menlo Park, CA (United States). Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29116. Order Number DE95000047. Source: OSTI; NTIS; GPO Dep.

An instrument is being developed that will be capable of providing real-time (<1 minute), quantitative, chemical analysis of gaseous and particulate pollutants generated from DOE waste cleanup activities. The instrument can detect and identify volatile organic compounds, polynuclear aromatic hydrocarbons, heavy metals, and transuranic species released during waste cleanup. It consists of an isokinetic sampler operable up to 500 K and wide flow rate range, a high- to low-pressure transition and sampling region separating particles from vapors for separate analysis, two small mass spectrometers (one for organic analysis by field ionization and one for particulate analysis by thermal pyrolysis

and electron-impact ionization), and a powerful PC for control/data acquisition. Initially, the instrument will be used with the K-1435 Toxic Substances Control Act (TSCA) incinerator at K-25; other applications are also possible, eg, vitrification monitoring, storage tank offgassing analysis, etc. It will be easily transportable. This report details the technical accomplishments of Phase I.

510 (DOE/MC/29118-95/C0428) **Field-usable portable analyzer for chlorinated organic compounds.** Buttner, W.J. Transducer Research, Inc., Naperville, IL (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29118. (CONF-9411149-27: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007970. Source: OSTI; NTIS; GPO Dep.

Using an advanced chemical sensor, a hand portable analytical instrument for selectively detecting vapors of chlorinated solvents was produced. Phase I involved the development and testing of the analyzer and samplers for vapors over a broad concentration range from different sample matrices. The instrument, the RCL MONITOR, was tested in actual hazardous waste site operations. Phase II (initiated June 1994) involves production of full scale units and deployment in actual DOE operations (Hanford, INEL, Savannah River).

511 (DOE/MC/29120-95/C0416) **Review of the Vortec soil remediation demonstration program.** Patten, J.S. Vortec Corp., Collegeville, PA (United States). [1994]. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29120. (CONF-9411149-24: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007498. Source: OSTI; NTIS; INIS; GPO Dep.

The principal objective of the METC/Vortec program is to develop and demonstrate the effectiveness of the Vortec CMS in remediating soils contaminated with hazardous materials and/or low levels of radionuclides. To convincingly demonstrate the CMS's capability, a Demonstration Plant will be constructed and operated at a DOE site that has a need for the remediation of contamination soil. The following objectives will be met during the program: (1) establish the glass chemistry requirements to achieve vitrification of contaminated soils found at the selected DOE site; (2) complete the design of a fully integrated soil vitrification demonstration plant with a capacity to process 25 TPD of soil; (3) establish the cost of a fully integrated soil demonstration plant with a capacity to process 25 TPD of soil; (4) construct and operate a fully integrated demonstration plant; (5) analyze all influent and effluent streams to establish the partitioning of contaminants and to demonstrate compliance with all applicable health, safety, and environmental requirements; (6) demonstrate that the CMS technology has the capability to produce a vitrified product that will immobilize the hazardous and radionuclide materials consistent with the needs of the specific DOE waste repositories.

512 (DOE/MC/29120-3717) **Innovative fossil fuel fired vitrification technology for soil remediation: Phase 1.** Vortec Corp., Collegeville, PA (United States). Jan 1994. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29120. Order Number DE94004105. Source: OSTI; NTIS; INIS; GPO Dep.

Vortec has successfully completed Phase 1 of the "Innovative Fossil Fuel Fired Vitrification Technology for Soil Remediation" program. The Combustion and Melting System (CMS) has processed 7000 pounds of material representative of contaminated soil that is found at DOE sites. The soil was spiked with Resource Conservation and Recovery Act (RCRA) metals surrogates, an organic contaminant, and a surrogate radionuclide. The samples taken during the tests confirmed that virtually all of the radionuclide was retained in the glass and that it did not leach to the environment as confirmed by both ANS 16.1 and Toxicity Characteristic Leaching Procedure (TCLP) testing. The organic contaminant, anthracene, was destroyed during the test with a Destruction and Removal Efficiency (DRE) of at least 99.99%. RCRA metal surrogates, that were in the vitrified product, were retained and did not leach to the environment as confirmed by the TCLP testing. Semi-volatile RCRA metal surrogates were captured by the Air Pollution Control (APC) system, and data on the amount of metal oxide particulate and the chemical composition of the particulate were established for use in the Phase 2 APC subsystem design.

513 (DOE/MC/29249-95/C0421) **Electromagnetic mixed waste processing system for asbestos decontamination.** Kasevich, R.S.; Nocito, T.; Vaux, W.G.; Snyder, T. KAI Technologies, Inc., Woburn, MA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-94MC29249. (CONF-9411149-7: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007495. Source: OSTI; NTIS; INIS; GPO Dep.

DOE sites contain a broad spectrum of asbestos materials (cloth, pipe lagging, sprayed insulation and other substances) which are contaminated with a combination of hazardous and radioactive wastes due to its use during the development of the US nuclear weapons complex. These wastes consist of cutting oils, lubricants, solvents, PCBs, heavy metals and radioactive contaminants. The radioactive contaminants are the activation, decay, and fission products of DOE operations. To allow disposal, the asbestos must be converted chemically, followed by removing and separating the hazardous and radioactive materials to prevent the formation of mixed wastes and to allow for both sanitary disposal and effective decontamination. Currently, no technology exists that can meet these sanitary and other objectives. An attempt was made to apply techniques that have already proved successful in the mining, oil, and metals processing industries to the development of a multi-stage process to remove and separate hazardous chemical radioactive materials from asbestos. This process uses three methods: ABCOV chemicals which converts the asbestos to a sanitary waste; dielectric heating to volatilize the organic materials; and electrochemical processing for the removal of heavy metals, RCRA wastes and radionuclides. This process will result in the destruction of over 99% of the asbestos; limit radioactive metal contamination to 0.2 Bq alpha per gram and 1 Bq beta and gamma per gram; reduce hazardous organics to levels compatible with current EPA policy for RCRA delisting; and achieve TCLP limits for all solidified waste.

514 (DOE/MC/29467-95/C0426) **Decontamination Systems Information and Research Program.** Berg, M. (and others); Sack, W.A.; Gabr, M. National Research Center for Coal and Energy, Morgantown, WV (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract FC21-92MC29467. (CONF-9411149-9: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007570. Source: OSTI; NTIS; INIS; GPO Dep.

The Decontamination Systems Information and Research Program at West Virginia University consists of research and development associated with hazardous waste remediation problems at the Department of Energy complex and elsewhere. This program seeks to facilitate expedited development and implementation of solutions to the nation's hazardous waste clean-up efforts. By a unique combination of university research and private technology development efforts, new paths toward implementing technology and speeding clean-ups are achievable. Mechanisms include aggressive industrial tie-ins to academic development programs, expedited support of small business technology development efforts, enhanced linkages to existing DOE programs, and facilitated access to hazardous waste sites. The program topically falls into an information component, which includes knowledge acquisition, technology evaluation and outreach activities and an R and D component, which develops and implements new and improved technologies. Projects began in February 1993 due to initiation of a Cooperative Agreement between West Virginia University and the Department of Energy.

515 (DOE/MC/29467-3778) Decontamination Systems Information and Research Program: Quarterly report, October-December 1993. National Research Center for Coal and Energy, Morgantown, WV (United States). Feb 1994. 314p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE94004143. Source: OSTI; NTIS; GPO Dep.

This report is a summary of the work conducted for the period of October-December 1993 by the West Virginia University for the US DOE Morgantown Energy Technology Center. Research under the program focuses on pertinent technology for hazardous waste clean-up. This report reflects the progress performed on sixteen technical projects encompassed by this program: Systematic assessment of the state of hazardous waste clean-up technologies; Site remediation technologies: (a) Drain-enhanced soil flushing and (b) In situ bio-remediation of organic contaminants; Excavation systems for hazardous waste sites; Dust control methods for in-situ nuclear waste handling; Chemical destruction of polychlorinated biphenyls; Development of organic sensors: Monolayer and multilayer self-assembled films for chemical sensors; Winfield lock and dam remediation; Assessment of technologies for hazardous waste site remediation: Non-treatment technologies and pilot scale test facility implementation; Remediation of hazardous sites with steam reforming; Microbial enrichment for enhancing biodegradation of hazardous organic wastes in soil; Soil decontamination with a packed flotation column; Treatment of volatile organic compounds using biofilters; Use of granular activated carbon columns for the simultaneous removal of organic, heavy metals, and radionuclides; Compact mercuric iodide detector technology development; Evaluation of IR and mass spectrometric techniques for on-site monitoring of volatile organic compounds; and Improved socio-economic assessment of alternative environmental restoration techniques.

516 (DOE/MC/29467-3779) Decontamination Systems Information and Research Program: Quarterly technical progress report, July 1-September 30, 1993.

National Research Center for Coal and Energy, Morgantown, WV (United States). Oct 1993. 432p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE94018526. Source: OSTI; NTIS; INIS; GPO Dep.

Progress reports are presented for the following projects: systematic assessment of the state of hazardous waste clean-up technologies; site remediation technologies—drain-enhanced soil flushing (DESF) for organic contaminants removal; excavation systems for hazardous waste sites; chemical destruction of polychlorinated biphenyls; development of organic sensors—monolayer and multilayer self-assembled films for chemical sensors; Winfield Lock and Dam remediation; Winfield cleanup survey; assessment of technologies for hazardous waste site remediation—non-treatment technologies and pilot scale test facility implementation; assessment of environmental remediation storage technology; assessment of environmental remediation excavation technology; assessment of environmental remediation monitoring technology; and remediation of hazardous sites with steam reforming.

517 (DOE/MC/29467-3785) Decontamination Systems Information and Research Program: Quarterly technical progress report, January 1-March 31, 1994. National Research Center for Coal and Energy, Morgantown, WV (United States). May 1994. 516p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE94018528. Source: OSTI; NTIS; GPO Dep.

West Virginia University (WVU) and the US DOE Morgantown Energy Technology Center (METC) entered into a Cooperative Agreement on August 29, 1992 entitled "Decontamination Systems Information and Research Programs." Stipulated within the Agreement is the requirement that WVU submit to METC a series of Technical Progress Reports on a quarterly basis. This report comprises the first Quarterly Technical Progress Report for Year 2 of the Agreement. This report reflects the progress and/or efforts performed on the sixteen (16) technical projects encompassed by the Year 2 Agreement for the period of January 1 through March 31, 1994. In situ bioremediation of chlorinated organic solvents; Microbial enrichment for enhancing in-situ biodegradation of hazardous organic wastes; Treatment of volatile organic compounds (VOCs) using biofilters; Drain-enhanced soil flushing (DESF) for organic contaminants removal; Chemical destruction of chlorinated organic compounds; Remediation of hazardous sites with steam reforming; Soil decontamination with a packed flotation column; Use of granular activated carbon columns for the simultaneous removal of organics, heavy metals, and radionuclides; Monolayer and multilayer self-assembled polyion films for gas-phase chemical sensors; Compact mercuric iodide detector technology development; Evaluation of IR and mass spectrometric techniques for on-site monitoring of volatile organic compounds; A systematic database of the state of hazardous waste clean-up technologies; Dust control methods for insitu nuclear and hazardous waste handling; Winfield Lock and Dam remediation; and Socio-economic assessment of alternative environmental restoration technologies.

518 (DOE/MC/29467-3807-Pt.2) Assessment of technologies for hazardous waste site remediation: Non-treatment technologies and pilot scale facility implementation - monitoring technology: Final report.

Johnson, H.R.; Overbey, W.K. Jr.; Molnar, D.L. BDM Federal, Inc., Morgantown, WV (United States). Feb 1994. 219p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE94015233. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study was to investigate and evaluate existing proven technologies for the monitoring of hazardous waste sites during remediation activities and to protect the health and safety of all related entities while complying with government regulations. The study began with a literature search to determine manufacturers and related instrumentation which would be applicable to the most complex (in terms of toxicity and mediums affected) sites. Criteria for monitoring and analyses were established and a functional analysis was performed to select the most appropriate instrumentation available. Gas Chromatography/Mass Spectrometry is the most widely accepted method for generating quantitative data given the characterization of the Winfield site. Fourier Transform Infrared Spectroscopy, while not a new technology, has the distinct advantage of measuring simultaneously hundreds of gaseous pollutants which can also be sparged from water and this technology received the highest score as per the functional analysis. To protect workers and the public surrounding remediation sites which are known to contain VOCs, on site monitoring prior to, and during the excavation operations, is recommended until enough data are obtained to assess the health risks to workers. The conclusion of this study is to recommend evaluation of both the mobile GC/MS and FTIR systems simultaneously in identical operating conditions.

519 (DOE/MC/29467-3877) Decontamination Systems Information and Research Program: Quarterly technical progress report for period, April 1-June 30, 1994. West Virginia Univ., Morgantown, WV (United States). Aug 1994. 669p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95001325. Source: OSTI; NTIS; GPO Dep.

This progress report summarizes current status of Decontamination Systems Information and Research Programs. Most of the projects are on schedule and most have not varied from their original objectives. The Sensor project has been redirected toward use of clathrates, but the overall objective of developing a useful specific sensor has not changed. The Insitu remediation project is now fully underway. The soil flotation project was delayed for a short time by the inability to produce an appropriate plutonium oxide surrogate from cerium oxide. The mercuric iodide project could use some photoluminescence spectroscopy analysis to find traps in the crystal. One of the most interesting accomplishments was work on dechlorination. Fenton's reagent was found to dechlorinate PCBs to the dichlorobiphenyl. Project titles are the following: In situ bioremediation of chlorinated organic solvents; microbial enrichment for enhancing in-situ biodegradation of hazardous organic wastes; treatment of volatile organic compounds (VOCs) using biofilters; drain enhanced soil flushing (DESF) for organic contaminants removal; chemical destruction of chlorinated organic compounds; remediation of hazardous sites with steam reforming; soil decontamination with a packed flotation column; use of granular activated carbon columns for the simultaneous removal of organics, heavy metals, radionuclides; monolayer and multilayer self-assembled polyion films for gas phase chemical sensors; compact mercuric iodine detector technology development; evaluation of IR and mass spectrometric techniques for on-site monitoring of volatile organic compounds; a systematic data base of the

sate of hazardous waste clean-up technologies; dust control methods for in-situ nuclear and hazardous waste handling; winfield lock and dam remediation; socio-economic assessment of alternative environmental restoration technologies; waste management education and research consortium (WERC) National environmental design.

520 (DOE/MC/29467-3939) Decontamination Systems Information and Research Program: Quarterly report, July-September 1994. National Research Center for Coal and Energy, Morgantown, WV (United States). Nov 1994. 377p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95000033. Source: OSTI; NTIS; INIS; GPO Dep.

West Virginia University (WVU) and the US DOE Morgantown Energy Technology Center (METC) entered into a Cooperative Agreement on August 29, 1992 entitled "Decontamination Systems Information and Research Programs" (DOE Instrument No.: DE-FC21-92MC29467). Stipulated within the Agreement is the requirement that WVU submit to METC a series of Technical Progress Reports on a quarterly basis. This report comprises the eighth Quarterly Technical Progress Report for the Agreement. This report reflects the progress and/or efforts performed on the 16 technical projects encompassed by the Agreement for the period of July 1 through September 30, 1994. These projects focus on the following: Bio-remediation of organic compounds, heavy metals, and radionuclides; miscellaneous remediation technologies; instrumentation; and technology assessments.

521 (DOE/MC/29467-3952) Waste Management Education and Research Consortium (WERC), National Environmental Design. Topical report. Reed, B.E. West Virginia Univ. Research Corp., Morgantown, WV (United States). Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95000043. Source: OSTI; NTIS; GPO Dep.

The 4th Annual Waste-Management Education and Research Consortium (WERC) for National Environmental Design was held on April 10-14 in Las Cruces, New Mexico. The purpose of the WERC is to train students in the area of site remediation and restoration. Consistent with the Cooperative Agreement's 3rd Task, the ultimate goal of WERC is to provide training for potential engineers and scientists for the DOE's remediation and restoration efforts. WERC is sponsored by the Department of Energy and is housed at New Mexico State University. Two student groups from West Virginia University's Department of Civil and Environmental Engineering traveled to New Mexico. Group 1 was composed of graduate students and Group 2 was composed of undergraduate students. Students who participated in this program were exposed to all aspects of the solution of a real life environmental problem.

522 (DOE/MC/29467-3986) Management, visualization, and analysis of environmental and geotechnical data. Topical report. West Virginia Univ. Research Corp., Morgantown, WV (United States). Sep 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95000063. Source: OSTI; NTIS; GPO Dep.

This document is a topical report evaluating current technology on the management, visualization, and analysis of engineering and environmental data. This report gives an overview and assessment of the Integrated Computer Assisted Site Evaluation /Graphical Remedial Assessment and Cost Evaluation (ISACE/GRACE) system and includes brief

descriptions of the Environmental Technology '94: Computing and Information Conference and the National Conference on Environmental Problem Solving with GIS.

523 (DOE/MC/30171-94/C0344) **Quantum-catalytic extraction process application to mixed waste processing.** Herbst, C.A. (Molten Metal Technology, Fall River, MA (United States)); Loewen, E.P.; Nagel, C.J.; Protopapas, A. Molten Metals Technology, Inc., Waltham, MA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States); American Nuclear Society, La Grange Park, IL (United States); Japan Atomic Energy Research Inst., Tokyo (Japan); International Atomic Energy Agency, Vienna (Austria). DOE Contract AC21-93MC30171. (CONF-940815-59: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94014873. Source: OSTI; NTIS; INIS; GPO Dep.

The Catalytic Extraction Process (CEP) is a flexible and innovative technology which can process hazardous waste streams in a wide range of chemical and physical forms. The capabilities of CEP technology have been demonstrated on a commercial-scale prototype on RCRA listed hazardous waste streams. The results indicate that CEP can achieve almost 100% recycling of feed to commercially valuable products while maintaining high environmental performance. Specifically, CEP achieves Destruction Removal Efficiencies (DREs) $\geq 99.9999\%$ with no detectable amounts of trace components. Furthermore, any solid products are non-leachable. Quantum-CEP™, a technology that has evolved from CEP, allows processing of mixed waste streams and preparation for final form disposal. This paper discusses the theoretically achievable and experimentally demonstrated radionuclide partitioning achieved by Quantum-CEP. It also discusses the theoretical foundations and experimental evidence of Quantum-CEP's flexibility to drive partitioning to the desired phase by manipulating operating conditions, hence significantly improving volume reduction. Specifically, this paper focuses on (i) processing contaminated scrap metal and (ii) processing contaminated ion exchange resins using Quantum-CEP. Radionuclide surrogate demonstrations using CEP outlined in this paper indicate decontamination of metal to greater than 99% (limited by the lower detection limit (LDL)) while achieving stabilization of the vitreous phase. Processing of ion exchange resins contaminated with radioactive cobalt and cesium using CEP indicate complete recovery and concentration of the cobalt in the metal phase and condensation and capture of the cesium from the gaseous phase.

524 (DOE/MC/30175-95/C0439) **Portable sensor for hazardous waste.** Piper, L.G. Physical Sciences, Inc., Andover, MA (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30175. (CONF-9411149-23: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95008364. Source: OSTI; NTIS; INIS; GPO Dep.

Objective was to develop a field-portable monitor for sensitive hazardous waste detection using active nitrogen energy transfer (ANET) excitation of atomic and molecular fluorescence (active nitrogen is made in a dielectric-barrier discharge in nitrogen). It should provide rapid field screening of hazardous waste sites to map areas of greatest contamination. Results indicate that ANET is very sensitive for monitoring heavy metals (Hg, Se) and hydrocarbons; furthermore, chlorinated hydrocarbons can be distinguished

from nonchlorinated ones. Sensitivity is at ppB levels for sampling in air. ANET appears ideal for on-line monitoring of toxic heavy metal levels at building sites, hazardous waste landfills, in combustor flues, and of chlorinated hydrocarbon levels at building sites and hazardous waste dumps.

525 (DOE/MC/31185-94/C0347) **The DuPont, Monsanto, General Electric "Lasagna" Remediation Project - joint R&D and financing.** Palmer, P.A. Monsanto Co., Paducah, KY (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31185. (CONF-9409300-1: Options for land remediation: risk assessment strategies: quality of investigation on technological advances and project financing, London (United Kingdom), 8 Sep 1994). Order Number DE95007693. Source: OSTI; NTIS; INIS; GPO Dep.

The Lasagna project is the first of what we expect will be several large cooperative projects between industry consortia and government to develop improved remediation technologies. In 1992, Monsanto Company began contacting other major corporations to see if they were experiencing similar difficulties in applying cost-effective, or even workable technologies for industrial site remediation. Both General Electric and DuPont were early participants in the effort to develop a meeting with the EPA to discuss technical problems faced in cleanup, research needs, and ways to accelerate development of more cost-effective techniques. This paper provides some background on how this cooperative process came to reality, what the Lasagna process is and how the cooperative arrangements and financing are structured.

526 (DOE/METC-95/1014, pp. 12-19) **Waste Inspection Tomography (WIT).** Bernardi, R.T.; Han, Kyung S. USDOE Morgantown Energy Technology Center, WV (United States). Nov 1994. DOE Contract AC21-93MC30173. (CONF-9411149-: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). In *Proceedings of Opportunity '95 - Environmental technology through small business*. 264p. Order Number DE95000040. Source: OSTI; NTIS; INIS; GPO Dep.

This article describes the Waste Inspection Tomography Program. The program provides an inspection system that offers the nuclear waste evaluator a unique combination of tools for regulatory-driven characterization of low-level waste, transuranic waste, and mixed waste drums. WIT provides nondestructive, noninvasive and environmentally safe inspections using x-ray and gamma ray technologies with reasonable cost and throughput. Included are background information; project description; and results. 11 figs.

527 (DOE/METC-95/1014, pp. 27-42) **Review of the Vortec soil remediation demonstration program.** Patten, J.S. USDOE Morgantown Energy Technology Center, WV (United States). Nov 1994. DOE Contract AC21-92MC29120. (CONF-9411149-: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). In *Proceedings of Opportunity '95 - Environmental technology through small business*. 264p. Order Number DE95000040. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE's clean-up of its nuclear complex requires the development of innovative technologies to convert soils contaminated by hazardous and/or radioactive wastes to forms which can be readily disposed in accordance with current waste disposal methods. The unique features of Vortec CMS

technology should make it particularly cost-effective process for the vitrification of soils, sediments, sludges, and mill tailings containing organic metallic and/or radioactive contaminants. This article describes the technology (Votec's combustion and melting system), the results of testing, the demonstration plant system, and summarizes the future schedule and the equipment needed. 3 figs., 3 tabs.

528 (DOE/METC/C-95/7163) Field-usable portable analyzer for chlorinated organic compounds. Buttner, W.J. (Transducer Research, Inc., Naperville, IL (United States)); Stetter, J.R.; Nakaishi, C. Transducer Research, Inc., Naperville, IL (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29118. (CONF-940815-101: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95003127. Source: OSTI; NTIS; GPO Dep.

A solid-state sensor was developed with selectivity for chlorinated organic vapors and sub-ppm sensitivity. DOE and TRI are currently developing an advanced chlorinated organic vapor monitor. Objective is to extend the analytical capabilities of this new sensing technology by designing and building an advanced instrument package. Design goals include a user-friendly, conveniently packaged instrument; a broad dynamic range provided by intelligent sampler systems including direct sampling, autodilution, and preconcentration; and an analytical capability for condensed media a specialized sampler. Field testing of the advanced chlorinated organic vapor monitor demonstrated capability rapid, selective, on-site chemical analyses not. For example, the soil around 100N Bunker C area at DOE Hanford has trace contamination levels of chlorinated solvents, but is also heavily contaminated by oils which will show up on the OVM. The advanced chlorinated organic vapor monitor performed soil gas analysis on 5 soil gas probes in less than 30 minutes with vapor levels ranging between 0 and 2 ppm without interference from oil. Area surveys were performed at Hanford by site personnel who received training sessions lasting less than five minutes, thus demonstrating ease of instrument operation.

529 (DOE/MWIP-5) Technical area status report for second-stage destruction and offgas treatment. French, N.B. (Sandia National Labs., Livermore, CA (United States)); Dalton, J.D.; Vavruska, J. Sandia National Labs., Livermore, CA (United States). Aug 1994. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3778). Order Number DE95000999. Source: OSTI; NTIS; INIS; GPO Dep.

This report was sponsored by the Mixed Waste Integrated Program (MWIP), which was established by the Department of Energy (DOE), Office of Environmental Restoration and Waste Management (EM), Office of Technology Development (OTD). DOE/EM carries the charter to direct and coordinate waste management and site remediation throughout the DOE complex. Within EM, the OTD established the MWIP to identify and develop new technologies for treatment of DOE low-level mixed waste. This report represents the second TASR for the Second-Stage Destruction and Offgas Treatment technical area. This TASR updates technology information, a design methodology for air pollution control systems for mixed waste treatment, and technology development needs for DOE/EM. The TASRs form the basis of a technology development program that addresses the highest priority DOE environmental needs

and is coordinated with other technology development efforts both inside and outside DOE. The main functions of the second-stage destruction and offgas treatment system are to treat the gaseous effluent from the primary treatment process to acceptable levels for release to the atmosphere. Specific functions include (1) destruction of volatile organics; (2) capture of particulate matter; (3) capture of volatile metals; (4) capture and control of volatile, condensed-phase, and solid-phase radionuclides; (5) control of acid gases; (6) NO_x abatement; and (7) gas cooling and reheating as required to perform these functions.

530 (DOE/MWIP-16) Surrogate formulations for thermal treatment of low-level mixed waste, Part II: Selected mixed waste treatment project waste streams. Bostick, W.D. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Hoffmann, D.P.; Chiang, J.M.; Hermes, W.H.; Gibson, L.V. Jr.; Richmond, A.A.; Mayberry, J.; Frazier, G. Oak Ridge National Lab., TN (United States); Science Applications International Corp., Idaho Falls, ID (United States); Tennessee Univ., Knoxville, TN (United States). Jan 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. (ORNL/M-3640). Order Number DE94013982. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the formulation of surrogate waste packages, representing the major bulk constituent compositions for 12 waste stream classifications selected by the US DOE Mixed Waste Treatment Program. These waste groupings include: neutral aqueous wastes; aqueous halogenated organic liquids; ash; high organic content sludges; adsorbed aqueous and organic liquids; cement sludges; ashes, and solids; chloride; sulfate, and nitrate salts; organic matrix solids; heterogeneous debris; bulk combustibles; lab packs; and lead shapes. Insofar as possible, formulation of surrogate waste packages are referenced to authentic wastes in inventory within the DOE; however, the surrogate waste packages are intended to represent generic treatability group compositions. The intent is to specify a nonradiological synthetic mixture, with a minimal number of readily available components, that can be used to represent the significant challenges anticipated for treatment of the specified waste class. Performance testing and evaluation with use of a consistent series of surrogate wastes will provide a means for the initial assessment (and intercomparability) of candidate treatment technology applicability and performance. Originally the surrogate wastes were intended for use with emerging thermal treatment systems, but use may be extended to select nonthermal systems as well.

531 (DOE/MWIP-17) Surrogate formulations for thermal treatment of low-level mixed waste: Part 3: Plasma hearth process testing. Chiang, J.M. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Bostick, W.D.; Hoffman, D.P.; Hermes, W.H.; Gibson, L.V. Jr.; Richmond, A.A. Oak Ridge K-25 Site, TN (United States); Oak Ridge National Lab., TN (United States). Jan 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3641). Order Number DE94014051. Source: OSTI; NTIS; INIS; GPO Dep.

The plasma hearth process (PHP) presented in this report has been tested at a facility at Ukiah, California, in a cooperative effort between the Department of Energy (DOE), Science Applications International Corporation, Inc., and ReTech, Inc. The electrically heated plasma gas is used to

destroy organic materials and bind radionuclides and Resource Conservation and Recovery Act (RCRA) metals in the glassy slag. Proof-of-principle tests were conducted successfully using nonhazardous and non-radioactive materials placed in 30-gal steel drums. On-line analyses of the gaseous effluents indicated complete combustion; emissions of CO, NO_x, and particulates were low. The process also produced highly stable solid waste forms. The experiments for the next phase have been planned employing surrogates for the hazardous and radioactive components of the simulated waste streams. Natural cerium oxide is selected to simulate the behavior of radioactive actinide and transuranium elements, while natural cesium chloride is simulated for the study of relatively volatile radioactive fission products. For RCRA organics, naphthalene and 1,2-dichlorobenzene are semivolatile compounds selected to represent significant challenges to thermal destruction, whereas chlorobenzene is selected for the study of relatively volatile organics. Salts of chromium, nickel, lead, and cadmium are chosen to represent the twelve regulated toxic metals for emission and partitioning studies. The simulated waste packages presented in the text do not necessarily represent an individual waste stream within the DOE complex; rather, they were formulated to represent the most probable components in generic waste stream categories.

532 (DOE/MWIP-18) MWIP: Surrogate formulations for thermal treatment of low-level mixed waste: Part 4, Wastewater treatment sludges. Bostick, W.D. (Oak Ridge National Lab., TN (United States)); Hoffmann, D.P.; Stevenson, R.J.; Richmond, A.A.; Bickford, D.F. Oak Ridge K-25 Site, TN (United States). Jan 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3642). Order Number DE94014572. Source: OSTI; NTIS; INIS; GPO Dep.

The category of sludges, filter cakes, and other waste processing residuals represent the largest volume of low-level mixed (hazardous and radioactive) wastes within the US Department of Energy (DOE) complex. Treatment of these wastes to minimize the mobility of contaminants, and to eliminate the presence of free water, is required under the Federal Facility Compliance Act agreements between DOE and the Environmental Protection Agency. In the text, we summarize the currently available data for several of the high priority mixed-waste sludge inventories within DOE. Los Alamos National Laboratory TA-50 Sludge and Rocky Flats Plant By-Pass Sludge are transuranic (TRU)-contaminated sludges that were isolated with the use of silica-based filter aids. The Oak Ridge Y-12 Plant West End Treatment Facility Sludge is predominantly calcium carbonate and biomass. The Oak Ridge K-25 Site Pond Waste is a large-volume waste stream, containing clay, silt, and other debris in addition to precipitated metal hydroxides. We formulate "simulants" for the waste streams described above, using cerium oxide as a surrogate for the uranium or plutonium present in the authentic material. Use of nonradiological surrogates greatly simplifies material handling requirements for initial treatability studies. The use of synthetic mixtures for initial treatability testing will facilitate compositional variation for use in conjunction with statistical design experiments; this approach may help to identify any "operating window" limitations. The initial treatability testing demonstrations utilizing these "simulants" will be based upon vitrification, although the materials are also amenable to testing grout-based and other stabilization procedures. After the feasibility of treatment and the initial evaluation of treatment performance has

been demonstrated, performance must be verified using authentic samples of the candidate waste stream.

533 (DOE/MWIP-20) Treatment technology analysis for mixed waste containers and debris. Gehrke, R.J. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Brown, C.H.; Langton, C.A.; Askew, N.M.; Kan, T.; Schwinkendorf, W.E. Oak Ridge National Lab., TN (United States). Mar 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3609). Order Number DE94015451. Source: OSTI; NTIS; INIS; GPO Dep.

A team was assembled to develop technology needs and strategies for treatment of mixed waste debris and empty containers in the Department of Energy (DOE) complex, and to determine the advantages and disadvantages of applying the Debris and Empty Container Rules to these wastes. These rules issued by the Environmental Protection Agency (EPA) apply only to the hazardous component of mixed debris. Hazardous debris that is subjected to regulations under the Atomic Energy Act because of its radioactivity (i.e., mixed debris) is also subject to the debris treatment standards. The issue of treating debris per the Resource Conservation and Recovery Act (RCRA) at the same time or in conjunction with decontamination of the radioactive contamination was also addressed. Resolution of this issue requires policy development by DOE Headquarters of de minimis concentrations for radioactivity and release of material to Subtitle D landfills or into the commercial sector. The task team recommends that, since alternate treatment technologies (for the hazardous component) are Best Demonstrated Available Technology (BDAT): (1) funding should focus on demonstration, testing, and evaluation of BDAT on mixed debris, (2) funding should also consider verification of alternative treatments for the decontamination of radioactive debris, and (3) DOE should establish criteria for the recycle/reuse or disposal of treated and decontaminated mixed debris as municipal waste.

534 (DOE/MWIP-29) Mixed Waste Integrated Program Quality Assurance requirements plan. Oak Ridge National Lab., TN (United States). 15 Apr 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3691). Order Number DE94015425. Source: OSTI; NTIS; INIS; GPO Dep.

Mixed Waste Integrated Program (MWIP) is sponsored by the US Department of Energy (DOE), Office of Technology Development, Waste Management Division. The strategic objectives of MWIP are defined in the Mixed Waste Integrated Program Strategic Plan, and expanded upon in the MWIP Program Management Plan. This MWIP Quality Assurance Requirement Plan (QARP) applies to mixed waste treatment technologies involving both hazardous and radioactive constituents. As a DOE organization, MWIP is required to develop, implement, and maintain a written Quality Assurance Program in accordance with DOE Order 4700.1 Project Management System, DOE Order 5700.6C, Quality Assurance, DOE Order 5820.2A Radioactive Waste Management, ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities and ANSI/ASQC E4-19xx Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs. The purpose of the MWIP QA program is to establish controls which address the requirements in 5700.6C, with the intent to minimize risks and potential environmental impacts; and to maximize environmental protection, health, safety, reliability, and performance in all program activities.

QA program controls are established to assure that each participating organization conducts its activities in a manner consistent with risks posed by those activities.

535 (DOE/MWIP-30) Proposed waste form performance criteria and testing methods for low-level mixed waste. Franz, E.M. (Brookhaven National Lab., Upton, NY (United States)); Fuhrmann, M.; Bowerman, B.; Bates, S.; Peters, R. Brookhaven National Lab., Upton, NY (United States). Aug 1994. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-52436). Order Number DE95003025. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes proposed waste form performance criteria and testing method that could be used as guidance in judging viability of a waste form as a physico-chemical barrier to releases of radionuclides and RCRA regulated hazardous components. It is assumed that release of contaminants by leaching is the single most important property by which the effectiveness of a waste form is judged. A two-tier regimen is proposed. The first tier includes a leach test required by the Environmental Protection Agency and a leach test designed to determine the net forward leach rate for a variety of materials. The second tier of tests are to determine if a set of stresses (i.e., radiation, freeze-thaw, wet-dry cycling) on the waste form adversely impact its ability to retain contaminants and remain physically intact. It is recommended that the first tier tests be performed first to determine acceptability. Only on passing the given specifications for the leach tests should other tests be performed. In the absence of site-specific performance assessments (PA), two generic modeling exercises are described which were used to calculate proposed acceptable leach rates.

536 (DOE/OR-01-1158) Treatability study work plan for in situ vitrification of seepage pit 1 in Waste Area Grouping 7 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Spalding, B.P. Oak Ridge National Lab., TN (United States). Environmental Sciences Div. Jul 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-190). Order Number DE95003261. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4157.

A treatability study is described that encompasses the application of in situ vitrification (ISV) to at least two segments of Oak Ridge National Laboratory (ORNL) seepage pit 1 by the end of fiscal year 1995. This treatability study will establish the field-scale technical performance of ISV for (1) attaining the required depth, nominally 15 ft, to incorporate source contamination within and beneath the pits; (2) demonstrating field capability for the overlapping melt settings that are necessary to achieve fused melt segments; (3) demonstrating off-gas handling technology for accommodating and minimizing the volatilization of ¹³⁷Cs; (4) demonstrating adequate site characterization techniques to predict ISV melting kinetics, processing temperatures, and product durability; and (5) promoting public acceptance of ISV technology by demonstrating its safety, implementability, site impacts, and air emissions and by coordinating the treatability study within the regulatory closure process. The initial step of this treatability study will be to gather the required site characterization data about pit 1 so that the in situ vitrification can be effectively and safely planned. The second phase will be the field ISV operations at pit 1 employing at least two settings to achieve overlapping and

fused melts. Such field operations are likely to require 6 to 8 weeks. Following termination of ISV melting operations at pit 1 and demobilization of portable ISV equipment and the off-gas hood, posttest characterization activities will begin.

537 (DOE/OR-01-1161/V1-D2) Remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 Ponds, Boneyard/Burnyard, Oil Landfarm, Sanitary Landfill I, and the Burial Grounds, including Oil Retention Ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Volume 1, Main text. Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Mar 1994. 446p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER-105/V1-D2). Order Number DE95002068. Source: OSTI; NTIS; INIS; GPO Dep.

This document refers to data concerning the Environmental Restoration Program implemented at the Oak Ridge Y-12 plant. Topics discussed include: Remediation plans for the burial grounds, sanitary landfill I, oil retention ponds, S-3 ponds, and the boneyard/burnyard at Y-12. This document also contains information about the environmental policies regulating the remediation.

538 (DOE/OR-01-1161/V1-D2/A1) Addendum to the remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 ponds, boneyard/burnyard, oil landfarm, sanitary landfill I, and the burial grounds, including oil retention ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1, main text. Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Aug 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (Y/ER-105/V1-D2/A1). Order Number DE95002055. Source: OSTI; NTIS; INIS; GPO Dep.

The BCV OU 1 location poses two problems that Data Quality Objectives will address: (1) whether the wastes and soil contamination pose a risk to human health or the environment now or in the future and (2) if the wastes and contamination do pose a risk, what feasible alternatives exist for reducing the risk to acceptable levels?

539 (DOE/OR-01-1167-D2) Detailed Leak Detection Test Plan and schedule for the Oak Ridge National Laboratory liquid low-level waste active pipelines. Oak Ridge National Lab., TN (United States); Vista Research, Inc., Mountain View, CA (United States). Aug 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-171-D2). Order Number DE94019211. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a detailed leak detection test plan and schedule for the pipelines that comprise the active, singly contained, portion of the liquid low-level waste (LLLW) system at the Oak Ridge National Laboratory (ORNL). This plan was prepared in response to the requirements of the Federal Facility Agreement for the Oak Ridge Reservation (FFA) between the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC). The LLLW system is an interconnected complex of tanks and pipelines. The FFA distinguishes four categories of tank and pipeline systems within this complex: new or replacement tank systems with secondary containment (Category A), existing tank systems with secondary containment (Category B), existing tank systems without secondary containment (Category C), and tank systems that have been

removed from service (Category D). The FFA specifically requires that DOE demonstrate that the Category C systems are not leaking. This plan and schedule addresses testing of the Category C pipelines and the pipelines which are part of Category B tank systems that do not fully meet the requirements for secondary containment as listed in the FFA. A key feature of the plan is that it is based on the use of performance standards for the conduct of release detection testing, and on the use of methods whose performance has been evaluated and shown to meet those standards. Another feature of the plan is that it is based in part on relevant portions of current federal EPA regulations applicable to underground storage tanks and pipelines (UST systems) that store and transfer petroleum products and other hazardous substances. While the FFA does not require that the testing at ORNL follow these regulations, the regulations do provide industry- and regulator-accepted performance standards, as well as a schedule for repeated testing of UST components.

540 (DOE/OR-01-1193-D2) Quality Assurance Project Plan for the Environmental Monitoring Program in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Knoxville, TN (United States). Dec 1993. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3028). Order Number DE94013603. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Area Grouping (WAG) 6 is a hazardous and low-level radioactive waste disposal site at Oak Ridge National Laboratory (ORNL). Extensive site investigations have revealed contaminated surface water, sediments, groundwater, and soils. Based on the results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) conducted from 1989-1991 and on recent interactions with the US Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC), a decision was made to defer implementing source control remedial measures at the WAG. The information shows WAG 6 contributes < 2% of the total off-site contaminant risk released over White Oak Dam (WOD). The alternative selected to address hazards at WAG 6 involves maintenance of site access controls to prevent public exposure to on-site contaminants, continued monitoring of contaminant releases to determine if source control measures will be required in the future, and development of technologies to support final remediation of WAG 6. This Quality Assurance Project Plan (QAPJP) has been developed as part of the Environmental Monitoring Plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee (DOE/OR/01-1192&D1). Environmental monitoring will be conducted in two phases: the baseline monitoring phase and the routine annual monitoring phase. The baseline monitoring phase will be conducted to establish the baseline contaminant release conditions at the Waste Area Grouping (WAG), to confirm the site-related chemicals of concern (COC), and to gather data to confirm the site hydrologic model. The baseline monitoring phase is expected to begin in 1994 and continue for 12-18 months. The routine annual monitoring phase will consist of continued sampling and analyses of COC to determine off-WAG contaminant flux, to identify trends in releases, and to confirm the COC. The routine annual monitoring phase will continue for ~4 years.

541 (DOE/OR-01-1258-D2) Design assessment for Melton Valley liquid low-level waste collection and transfer system upgrade project at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3805). Order Number DE95004742. Source: OSTI; NTIS; INIS; GPO Dep.

This project is designed for collecting liquid low level waste (LLLW) from generating points inside the Radioisotope Engineering and Development Center (Buildings 7920 and 7930) facility and transferring this waste to the Collection Tank (F-1800) in the new Monitoring and Control Station (MCS) facility. The LLLW is transferred to the MCS in a new, underground, jacketed, stainless steel piping system. The LLLW will then be transferred from Tank F-1800 through a new, underground, jacketed, stainless steel piping system that connects the existing Bethel Valley LLLW Collection System and the Evaporator Facility Service Tanks. The interface for the two systems will be at the existing Interconnecting Pipe Line (ICPL) Valve Box adjacent to the Nonradiological Wastewater Treatment Plant. The project scope consists of the following systems: (1) Building 7920 LLLW Collection System; (2) Building 7930 LLLW Collection System; (3) LLLW Underground Transfer System to MCS; (4) MCS Building (including all equipment contained therein); (5) LLLW Underground Transfer System to ICPL Valve Box; and (6) Leak detection system for jacketed piping systems (3) and (5).

542 (DOE/OR-01-1268/V1-D1) Remedial Investigation Report on Chestnut Ridge Operable Unit 2 (Filled Coal Ash Pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. Main Text. Oak Ridge Y-12 Plant, TN (United States). Aug 1994. 563p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001697. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a report on the remedial investigation (RI) of Chestnut Ridge Operable Unit (OU) 2 at the Oak Ridge Y-12 Plant. Chestnut Ridge OU 2 consists of Upper McCoy Branch (UMB), the Filled Coal Ash Pond (FCAP), and the area surrounding the Sluice Channel formerly associated with coal ash disposal in the FCAP. Chestnut Ridge OU 2 is located within the U.S. Department of Energy's (DOE's) Oak Ridge Reservation in Anderson County, Tennessee, approximately 24 miles west of Knoxville. The pond is an 8.5-acre area on the southern slope of Chestnut Ridge, 0.5 mile south of the main Y-12 Plant and geographically separated from the Y-12 Plant by Chestnut Ridge. The elevation of the FCAP is ~ 950 ft above mean sea level (msl), and it is relatively flat and largely vegetated. Two small ponds are usually present at the northeast and northwest corners of the FCAP. The Sluice Channel Area extends ~1000 ft from the northern margin of the FCAP to the crest of Chestnut Ridge, which has an elevation of ~1100 ft above msl. The Sluice Channel Area is largely vegetated also. McCoy Branch runs from the top of Chestnut Ridge across the FCAP into Rogers Quarry and out of the quarry where it runs a short distance into Milton Hill Lake at McCoy Embayment, termed UMB. The portion south of Rogers Quarry, within Chestnut Ridge OU 4, is termed Lower McCoy Branch. The DOE Oak Ridge Y-12 Plant disposed of coal ash from its steam plant operations as a slurry that was discharged into an ash retention impoundment; this impoundment is the FCAP. The FCAP was built in 1955 to

serve as a settling basin after coal ash slurried over Chestnut Ridge from the Y-12 Plant. The FCAP was constructed by building an earthen dam across the northern tributary of McCoy Branch. The dam was designed to hold 20 years of Y-12 steam plant ash. By July 1967, ash had filled up the impoundment storage behind the dam to within 4 ft of the top.

543 (DOE/OR-01-1276-D1) Implementation plan for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory under the Federal Facility Agreement, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Jun 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-242-D1). Order Number DE94017161. Source: OSTI; NTIS; INIS; GPO Dep.

Plans and schedules for meeting the Federal Facility Agreement (FFA) commitments for the Liquid Low-Level Waste (LLLW) System at Oak Ridge National Laboratory (ORNL) were initially submitted in ES/ER-17&D1, Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee. The information presented in the current document summarizes the progress that has been made to date and provides a comprehensive summary to facilitate understanding of the FFA compliance program for LLLW tank systems and to present the plans and schedules associated with the remediation, through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, of LLLW tank systems that have been removed from service. A comprehensive program is under way at ORNL to upgrade the LLLW system as necessary to meet the FFA requirements. The tank systems that are removed from service are being investigated and remediated through the CERCLA process. Waste and risk characterizations have been submitted. Additional data will be submitted to the US Environmental Protection Agency and the Tennessee Department of Environment and Conservation (EPA/TDEC) as tanks are taken out of service and as required by the remedial investigation/feasibility study (RI/FS) process. The plans and schedules for implementing the FFA compliance program that were originally submitted in ES/ER-17&D 1, Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste tanks Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee, are updated in the present document. Chapter 1 provides general background information and philosophies that lead to the plans and schedules that appear in Chaps. 2 through 5.

544 (DOE/OR-01-1276-D2) Implementation Plan for Liquid Low-Level Radioactive Waste tank systems at Oak Ridge National Laboratory under the Federal Facility Agreement, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Sep 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-242-D2). Order Number DE95001380. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the progress that has been made to date in implementing the plans and schedules for meeting the Federal Facility Agreement (FFA) commitments for the Liquid Low-Level Waste (LLLW) System at Oak Ridge National Laboratory (ORNL). These commitments were initially submitted in ES/ER-17&D1, Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Information presented in

this document provides a comprehensive summary to facilitate understanding of the FFA compliance program for LLLW tank systems and to present plans and schedules associated with remediation, through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, of LLLW tank systems that have been removed from service. ORNL has a comprehensive program underway to upgrade the LLLW system as necessary to meet the FFA requirements. The tank systems that are removed from service are being investigated and remediated through the CERCLA process. Waste and risk characterizations have been submitted. Additional data will be prepared and submitted to EPA/TDEC as tanks are taken out of service and as required by the remedial investigation/feasibility study (RI/FS) process. The plans and schedules for implementing the FFA compliance program that were submitted in ES/ER-17&D1, Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste tanks Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee, are updated in this document. Chapter 1 provides general background information and philosophies that lead to the plans and schedules that appear in Chaps. 2 through 5.

545 (DOE/OR-01-1288-D2) Work plan for the treatability study for PCB debalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Aug 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-224-D2). Order Number DE95002301. Source: OSTI; NTIS; INIS; GPO Dep.

This work Plan describes the treatability study for Polychlorinated biphenyl (PCB) debalogenation by Agent 313 (a registered trademark of the A.L. Sandpiper Corporation of Columbus, Ohio) to be conducted at Waste Area Grouping (WAG) 11 on the Oak Ridge Reservation. The study will be conducted at WAG 11 as a result of the contamination of several small areas of soil by leaking capacitors. The primary purpose of this treatability study is to demonstrate the effectiveness of Agent 313 in remediating PCB-contaminated soil. However, the WAG 11 soils to be treated may also contain radionuclides and metals. In addition to providing the procedures to be followed during the treatability study, the work plan briefly describes the project background and technology, lists applicable or relevant and appropriate requirements for the project, and delineates project goals and objectives. This document also follows the general suggested outline for treatability study work plans shown in the 1992 report Guide for conducting Treatability Studies Under CERCLA: Final, EPA/540/R-92-071a, published by the US Environmental Protection Agency.

546 (DOE/OR-01-1290-D1) Third annual environmental restoration monitoring and assessment report for FY 1994 of the Oak Ridge National Laboratory, Oak Ridge, Tennessee. Clapp, R.B.; Watts, J.A.; Guth, M.A.S. (eds.). Oak Ridge National Lab., TN (United States). Sep 1994. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-250). Order Number DE95004745. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4301.

This report summarizes the salient features of the annual efforts of environmental monitoring, field investigations, and assessments conducted to support the Environmental

Restoration (ER) Program at the Oak Ridge National Laboratory (ORNL). This report focuses on the watershed scale, providing an ORNL site-wide perspective on types, distribution, and transport of contamination. The results presented are used to enhance the conceptual understanding of the key contaminants and the sources, fluxes, and processes affecting their distribution and movement. This information forms a basis for prioritizing sites and for selecting, implementing, and evaluating remedial actions. This report summarizes the efforts of the Waste Area Grouping (WAG) 2 and Site Investigations (SI) Project. WAG 2 is the lower portion of the White Oak Creek system which drains the major contaminated sites at ORNL and discharges to the Clinch River where public access is allowed. The Remedial Investigation Plan (DOE 1992) for WAG 2 includes a long-term multimedia environmental monitoring effort that takes advantage of WAG 2's role as an integrator and the major conduit of contaminants from the ORNL site. During FY 1992, the remedial investigation activities were integrated with a series of environmental monitoring and SI activities at ORNL that address pathways and processes important for contaminant movement to gain a more integrated perspective of contamination movement at the watershed scale.

547 (DOE/OR-01-1291-D1) Annual status report on Federal Facility Agreement compliance for the Liquid Low-Level Waste tank systems at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States). Sep 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-252-D1). Order Number DE95001381. Source: OSTI; NTIS; INIS; GPO Dep.

This annual report summarizes the status of Federal Facility Agreement (FFA) compliance activities at Oak Ridge National Laboratory (ORNL) and describes the progress made over the past fiscal year. In fiscal 1994, ORNL issued the final submittal of the risk characterization data for the inactive tanks, the secondary containment design demonstration report for Category B piping, and the FFA Implementation Plan. In addition, two new LLLW tanks serving Building 2026 and the Transported Waste Receiving Facility were installed; leak testing was initiated for all active, singly contained tanks and piping; sources of inflow to inactive tanks were investigated and diversion to process waste was begun; and the W-12 tank system was repaired and a request to allow its temporary use was approved by EPA/TDEC. Programmatic improvements were also made during the year: a system for improved communication of FFA plans and activities was implemented in October 1993, a survey was conducted to ensure that all inactive drains are identified and sealed, and two meetings of the ORNL FFA Technical Advisory Group were held.

548 (DOE/OR-01-1311-D1) Design/Installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Knoxville, TN (United States). Oct 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-270-D1). Order Number DE95001772. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a Design/Installation and Structural Integrity Assessment for a replacement tank system for

portions of the Bethel Valley Low Level Waste (LLW) System, located at the Oak Ridge Reservation, Oak Ridge, Tennessee. This issue of the assessment covers the design aspects of the replacement tank system, and certifies that the design has sufficient structural integrity and is acceptable for the storing or treating of hazardous and/or radioactive substances. The present issue identifies specific activities that must be completed during the fabrication, installation, and testing of the replacement tank system in order to provide assurance that the final installation complies with governing requirements. Portions of the LLW system are several decades old, or older, and do not comply with current environmental protection regulations. Several subsystems of the LLW system have been designated to receive a state-of-the-art replacement and refurbishment. One such subsystem serves Building 2026, the High Radiation Level Analytical Laboratory. This assessment focuses on the scope of work for the Building 2026 replacement LLW Collection and Transfer System, including the provision of a new Monitoring and Control Station (Building 2099) to receive, store, and treat (adjust pH) low level radioactive waste.

549 (DOE/OR-01-1311-D2) Design/Installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley low-level waste collection and transfer system upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Oak Ridge, TN (United States). Nov 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-270-D2). Order Number DE95004740. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a Design/Installation and Structural Integrity Assessment for a replacement tank system for portions of the Bethel Valley Low-Level Waste (LLW) System, located at the Oak Ridge Reservation, Oak Ridge, Tennessee. This issue of the assessment covers the design aspects of the replacement tank system, and certifies that the design has sufficient structural integrity and is acceptable for the storing or treating of hazardous and/or radioactive substances. This document will be reissued at a future date and will then include the assessment of the installation of the replacement tank system. The present issue identifies specific activities that must be completed during the fabrication, installation, and testing of the replacement tank system in order to provide assurance that the final installation complies with governing requirements.

550 (DOE/OR-01-1312-D1) Design/Installation and Structural Integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Oak Ridge, TN (United States). Oct 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-273-D1). Order Number DE95002298. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a Design/Installation and Structural Integrity Assessment for a new tank system for portions of the Bethel Valley Low Level Waste (LLW) System, located at the Oak Ridge Reservation, Oak Ridge, Tennessee. This issue of the assessment covers the design aspects of the new tank system, and certifies that the design has sufficient structural integrity and is acceptable for

the storing or treating of hazardous and/or radioactive substances. This document will be reissued at a future date and will then include the assessment of the installation of the new tank system. The present issue identifies specific activities that must be completed during the fabrication, installation, and testing of the new tank system in order to provide assurance that the final installation complies with governing requirements. These requirements are based on meeting the intent of 40 CFR264 Subpart J - Tank Systems, as set forth in Appendix F to the Federal Facility Agreement, Docket No. 89-04-FF, covering the Oak Ridge Reservation. The assessment presented in this document is responsive to the Environmental Restoration Agreement for the Oak Ridge Reservation. The format utilized on preparation of the document follows the format presented in Appendix F, Low Level Radioactive Waste Tank Systems, appended to the Agreement.

551 (DOE/OR-01-1312-D2) Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and transfer system upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Oak Ridge, TN (United States). Jan 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-273-D2). Order Number DE95008648. Source: OSTI; NTIS; INIS; GPO Dep.

This document covers the design aspects of the new tank system and certifies that the design has sufficient structural integrity and is acceptable for storing or treating hazardous and/or radioactive substances. This issue identifies specific activities that must be completed during fabrication, installation, and testing of the new tank system in order to prove compliance of the final installation with governing requirements. The assessment is responsive to the Environmental Restoration Agreement for the Oak Ridge Reservation.

552 (DOE/OR-01-1313-D2) Design/Installation and structural integrity assessment of Bethel Valley low-level waste collection and transfer system upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Oak Ridge, TN (United States). Jan 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-274-D2). Order Number DE95008647. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes and assesses planned modifications to be made to the Building 3092 Central Off-Gas Scrubber Facility of the Oak Ridge National Laboratory, Oak Ridge, Tennessee. The modifications are made in response to the requirements of 40CFR264 Subpart J, relating to environmental protection requirements for buried tank systems. The modifications include the provision of a new scrubber recirculation tank in a new, below ground, lines concrete vault, replacing an existing recirculation sump that does not provide double containment. A new buried, double contained pipeline is provided to permit discharge of spent scrubber recirculation fluid to the Central Waste Collection Header. The new vault, tank, and discharge line are provided with leak detection and provisions to remove accumulated liquid. New scrubber recirculation pumps, piping, and accessories are also provided. This assessment concludes that the planned modifications comply with applicable

requirements of 40CFR264 Subpart J, as set forth in Appendix F to the Federal Facility Agreement, Docket No. 89-04-FF, covering the Oak Ridge Reservation.

553 (DOE/OR-01-1314-D1) Risk evaluation of embedded, single-walled liquid low-level waste piping at Oak Ridge National Laboratory: ESD Publication 4315. Oak Ridge National Lab., TN (United States). Oct 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-253). Order Number DE95002297. Source: OSTI; NTIS; INIS; GPO Dep.

Four categories of liquid low-level radioactive waste (LLLW) systems are defined in the Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR). Categories A and B are new and fully compliant existing systems, respectively; Category C is singly contained and must be removed from service, and Category D is inactive. The FFA requires that secondary containment and leak detection be provided for all Category A and B piping in the LLLW System at Oak Ridge National Laboratory (ORNL); however, as noted in the D2 revision of the secondary containment design demonstration report (DOE 1994), some sections of single-walled embedded piping in Category B underground vaults at three ORNL facilities do not meet this requirement. A risk evaluation was performed in order to compare the potential radiation dose to a member of the public that could result from a postulated leak in the single-walled pipes with projected radiation exposure to the workers who would modify the piping to meet FFA requirements. The risk to human health from replacing segments of embedded, single-walled piping in the LLLW system is higher than the risk of leaving the piping as it is.

554 (DOE/OR-03-1195-D2) Design demonstrations for Category B tank systems piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Dec 1994. 391p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-193-D2). Order Number DE95008964. Source: OSTI; NTIS; INIS; GPO Dep.

Demonstration of the design of the piping systems described in this report is stipulated by the Federal Facility Agreement (FFA) between the U.S. Environmental Protection Agency (EPA)-Region IV, the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Department of Energy (DOE). This report provides a design demonstration of the secondary containment and ancillary equipment of 30 piping systems designated in the FFA as Category B (i.e., existing tank systems with secondary containment). Based on the findings of the Design Demonstrations for the Remaining 19 Category B Tank Systems, (DOE/OR/03-1150 & D2), three tank systems originally designated as Category B have been redesignated as Category C (i.e., existing tank systems without secondary containment). The design demonstrations were developed using information obtained from design drawings (as-built when available), construction specifications, and interviews with facility operators. Each design demonstration addresses system conformance to the requirements of the FFA (Appendix F, Section C). Deficiencies or restrictions regarding the ability to demonstrate that each of the containment systems conforms to FFA requirements are noted in the discussion of each piping system and presented in Table 2.0-1.

555 (DOE/OR-1047-D2) Design demonstrations for category B tank systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN

(United States); Foster-Wheeler Environmental Corp., Oak Ridge, TN (United States). Nov 1994. 243p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3964). Order Number DE95004741. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents design demonstrations conducted of liquid low-level waste (LLW) storage tank systems located at the Oak Ridge National Laboratory (ORNL). Demonstration of the design of these tank systems has been stipulated by the Federal Facility Agreement (FFA) between the US Environmental Protection Agency (EPA)-Region IV; the Tennessee Department of Environment and Conservation (TDEC); and the DOE. The FFA establishes four categories of tanks. These are: Category A - New or replacement tank systems with secondary containment; Category B - Existing tank systems with secondary containment; Category C - Existing tank systems without secondary containment; Category D - Existing tank systems without secondary containment that are removed from service. This document provides a design demonstration of the secondary containment and ancillary equipment of 11 tank systems listed in the FFA as Category B. The design demonstration for each tank is presented.

556 (DOE/OR-23701-41.1) Baseline risk assessment for exposure to contaminants at the St. Louis Site, St. Louis, Missouri. Argonne National Lab., IL (United States). Nov 1993. 411p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94009473. Source: OSTI; NTIS; INIS; GPO Dep.

The St. Louis Site comprises three noncontiguous areas in and near St. Louis, Missouri: the St. Louis Downtown Site (SLDS), the St. Louis Airport Storage Site (SLAPS), and the Latty Avenue Properties. The main site of the Latty Avenue Properties includes the Hazelwood Interim Storage Site (HISS) and the Futura Coatings property, which are located at 9200 Latty Avenue. Contamination at the St. Louis Site is the result of uranium processing and disposal activities that took place from the 1940s through the 1970s. Uranium processing took place at the SLDS from 1942 through 1957. From the 1940s through the 1960s, SLAPS was used as a storage area for residues from the manufacturing operations at SLDS. The materials stored at SLAPS were bought by Continental Mining and Milling Company of Chicago, Illinois, in 1966, and moved to the HISS/Futura Coatings property at 9200 Latty Avenue. Vicinity properties became contaminated as a result of transport and movement of the contaminated material among SLDS, SLAPS, and the 9200 Latty Avenue property. This contamination led to the SLAPS, HISS, and Futura Coatings properties being placed on the National Priorities List (NPL) of the US Environmental Protection Agency (EPA). The US Department of Energy (DOE) is responsible for cleanup activities at the St. Louis Site under its Formerly Utilized Sites Remedial Action Program (FUSRAP). The primary goal of FUSRAP is the elimination of potential hazards to human health and the environment at former Manhattan Engineer District/Atomic Energy Commission (MED/AEC) sites so that, to the extent possible, these properties can be released for use without restrictions. To determine and establish cleanup goals for the St. Louis Site, DOE is currently preparing a remedial investigation/feasibility study-environmental impact statement (RI/FS-EIS). This baseline risk assessment (BRA) is a component of the process; it addresses potential risk to human health and the environment.

557 (DOE/OSTI-11684) Mixed Waste Working Group report. Western Governors' Association, Denver, CO (United States); Federal Advisory Committee to Develop On-Site Innovative Technologies, Washington, DC (United States). 9 Nov 1993. 158p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States); Department of the Interior, Washington, DC (United States); Department of Defense, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

The treatment of mixed waste remains one of this country's most vexing environmental problems. Mixed waste is the combination of radioactive waste and hazardous waste, as defined by the Resource Conservation and Recovery Act (RCRA). The Department of Energy (DOE), as the country's largest mixed waste generator, responsible for 95 percent of the Nation's mixed waste volume, is now required to address a strict set of milestones under the Federal Facility Compliance Act of 1992. DOE's earlier failure to adequately address the storage and treatment issues associated with mixed waste has led to a significant backlog of temporarily stored waste, significant quantities of buried waste, limited permanent disposal options, and inadequate treatment solutions. Between May and November of 1993, the Mixed Waste Working Group brought together stakeholders from around the Nation. Scientists, citizens, entrepreneurs, and bureaucrats convened in a series of forums to chart a course for accelerated testing of innovative mixed waste technologies. For the first time, a wide range of stakeholders were asked to examine new technologies that, if given the chance to be tested and evaluated, offer the prospect for better, safer, cheaper, and faster solutions to the mixed waste problem. In a matter of months, the Working Group has managed to bridge a gap between science and perception, engineer and citizen, and has developed a shared program for testing new technologies.

558 (DOE/RL-89-03-Rev.2A) Hanford facility dangerous waste permit application, 616 Nonradioactive Dangerous Waste Storage Facility: Revision 2A. Bowman, R.C. Department of Energy, Richland, WA (United States). Richland Operations Office. Apr 1994. 151p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017152. Source: OSTI; NTIS; INIS; GPO Dep.

This permit application for the 616 Nonradioactive Dangerous Waste Storage Facility consists of 15 chapters. Topics of discussion include the following: facility description and general provisions; waste characteristics; process information; personnel training; reporting and record keeping; and certification.

559 (DOE/RL-89-28-Rev.2) 216-B-3 expansion ponds closure plan. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 938p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004360. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the activities for clean closure under the Resource Conservation and Recovery Act of 1976 (RCRA) of the 216-B-3 Expansion Ponds. The 216-B-3 Expansion Ponds are operated by the US Department of Energy, Richland Operations Office (DOE-RL) and co-operated by Westinghouse Hanford Company (Westinghouse Hanford). The 216-B-3 Expansion Ponds consists of a series of three earthen, unlined, interconnected ponds that receive waste water from various 200 East Area operating

facilities. The 3A, 3B, and 3C ponds are referred to as Expansion Ponds because they expanded the capability of the B Pond System. Waste water (primarily cooling water, steam condensate, and sanitary water) from various 200 East Area facilities is discharged to the Bypass pipe (Project X-009). Water discharged to the Bypass pipe flows directly into the 216-B-3C Pond. The ponds were operated in a cascade mode, where the Main Pond overflowed into the 3A Pond and the 3A Pond overflowed into the 3C Pond. The 3B Pond has not received waste water since May 1985; however, when in operation, the 3B Pond received overflow from the 3A Pond. In the past, waste water discharges to the Expansion Ponds had the potential to have contained mixed waste (radioactive waste and dangerous waste). The radioactive portion of mixed waste has been interpreted by the US Department of Energy (DOE) to be regulated under the Atomic Energy Act of 1954; the dangerous waste portion of mixed waste is regulated under RCRA.

560 (DOE/RL-90-12-Rev.2) Request for interim approval to operate Trench 94 of the 218-E-12B Burial Ground as a chemical waste landfill for disposal of polychlorinated biphenyl waste in submarine reactor compartments: Revision 2. Cummins, G.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014246. Source: OSTI; NTIS; INIS; GPO Dep.

This request is submitted to seek interim approval to operate a Toxic Substances Control Act (TSCA) of 1976 chemical waste landfill for the disposal of polychlorinated biphenyl (PCB) waste. Operation of a chemical waste landfill for disposal of PCB waste is subject to the TSCA regulations of 40 CFR 761. Interim approval is requested for a period not to exceed 5 years from the date of approval. This request covers only the disposal of small 10 quantities of solid PCB waste contained in decommissioned, defueled submarine reactor compartments (SRC). In addition, the request applies only to disposal 12 of this waste in Trench 94 of the 218-E-12B Burial Ground (Trench 94) in the 13 200 East Area of the US Department of Energy's (DOE) Hanford Facility. Disposal of this waste will be conducted in accordance with the Compliance 15 Agreement (Appendix H) between the DOE Richland Operations Office (DOE-RL) and 16 the US Environmental Protection Agency (EPA), Region 10. During the 5-year interim approval period, the DOE-RL will submit an application seeking final 18 approval for operation of Trench 94 as a chemical waste landfill, including 19 any necessary waivers, and also will seek a final dangerous waste permit from 20 the Washington State Department of Ecology (Ecology) for disposal of lead 21 shielding contained in the SRCS.

561 (DOE/RL-90-22-Draft-F) RCRA Facility investigation/corrective measures study work plan for the 100-NR-1 operable unit: Hanford Site, Richland, Washington. Draft F. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007603. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan and the attached supporting project plans establish the operable unit setting and the objectives, procedures, tasks, and schedule for conducting the RCRA facility investigation/corrective measures study for the 100-NR-1 Source Operable Unit on the Hanford Reservation. Source operable units include facilities and unplanned release sites

that are potential sources of contamination. The operable unit includes all contamination found in the aquifer soils and water within its boundary.

562 (DOE/RL-90-38-Rev.1) Hanford Site Solid Waste Landfill permit application: Revision 1. USDOE Richland Operations Office, WA (United States). 30 Jul 1993. 958p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018683. Source: OSTI; NTIS; INIS; GPO Dep.

Both nonhazardous and nonradioactive sanitary solid waste are generated at the Hanford Site. This permit application describes the manner in which the Solid Waste Landfill will be operated. A description is provided of the landfill, including applicable locational, general facility, and landfilling standards. The characteristics and quantity of the waste disposed of are discussed. The regional and site geology and hydrology and the groundwater and vadose zone quality beneath the landfill are reviewed. A plan is included of operation, closure, and postclosure. This report addresses the operational cover, environmental controls, personnel requirements, inspections, recordkeeping, reporting, and site security. The integration of closure and postclosure activities between the Solid Waste Landfill and adjacent Nonradioactive Dangerous Waste Landfill is discussed.

563 (DOE/RL-91-19) RCRA facility investigation/corrective measures study work plan for the 200-UP-2 Operable Unit, Hanford Site, Richland, Washington. USDOE Richland Operations Office, WA (United States). Jun 1993. 246p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017324. Source: OSTI; NTIS; INIS; GPO Dep.

The 200-UP-2 Operable Unit is one of two source operable units at the U Plant Aggregate Area at the Hanford Site. Source operable units include waste management units and unplanned release sites that are potential sources of radioactive and/or hazardous substance contamination. This work plan, while maintaining the title RFI/CMS, presents the background and direction for conducting a limited field investigation in the 200-UP-2 Operable Unit, which is the first part of the process leading to final remedy selection. This report discusses the background, prior recommendations, goals, organization, and quality assurance for the 200-UP-2 Operable Unit Work Plan. The discussion begins with a summary of the regulatory framework and the role of the work plan. The specific recommendations leading into the work plan are then addressed. Next, the goals and organization of the report are discussed. Finally, the quality assurance and supporting documentation are presented.

564 (DOE/RL-91-46-Draft-D) RCRA facility investigation/corrective measures study work plan for the 100-NR-2 operable unit, Hanford Site, Richland, Washington. Draft D. USDOE Richland Operations Office, WA (United States). Sep 1994. 424p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007597. Source: OSTI; NTIS; INIS; GPO Dep.

Four areas of the Hanford Site (the 100, 200, 300, and 1100 Areas) have been included on the US Environmental Protection Agency's (EPA's) National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). More than 1,000 inactive waste disposal and unplanned release sites on the Hanford Site have been grouped into a number of source and groundwater operable units. These operable units

contain contamination in the form of hazardous waste, radioactive/hazardous mixed waste, and other CERCLA hazardous substances. Also included in the Tri-Party Agreement are 55 Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal (TSD) facilities that will be closed or permitted to operate in accordance with RCRA regulations. Some of the TSD facilities are included in the operable units. The Tri-Party Agreement requires that the cleanup programs at the Hanford Site integrate the requirements of CERCLA, RCRA, and Washington State's dangerous waste (RCRA-equivalent) program. Pursuant to the Tri-Party Agreement, the 100-NR-2 groundwater operable unit is subject to RCRA corrective action authority. This work plan and the attached supporting project plans establish the operable unit setting and the objectives, procedures, tasks, and schedule for conducting the RCRA facility investigation/corrective measures study (RFI/CMS) for the 100-NR-2 operable unit.

565 (DOE/RL-91-46-Draft-E) RCRA facility investigation/corrective measures study work plan for the 100-NR-2 operable unit, Hanford Site, Richland, Washington. Draft E. USDOE Richland Operations Office, WA (United States). Oct 1994. 374p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007598. Source: OSTI; NTIS; INIS; GPO Dep.

Four areas of the Hanford Site (the 100, 200, 300, and 1100 Areas) have been included on the US Environmental Protection Agency's (EPA's) National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). More than 1,000 inactive waste disposal and unplanned release sites on the Hanford Site have been grouped into a number of source and groundwater operable units. These operable units contain contamination in the form of hazardous waste, radioactive/hazardous mixed waste, and other CERCLA hazardous substances. Also included in the Tri-Party Agreement are 55 Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal (TSD) facilities that will be closed or permitted to operate in accordance with RCRA regulations. Some of the TSD facilities are included in the operable units. The Tri-Party Agreement requires that the cleanup programs at the Hanford Site integrate the requirements of CERCLA, RCRA, and Washington State's dangerous waste (RCRA-equivalent) program. Pursuant to the Tri-Party Agreement, the 100-NR-2 groundwater operable unit is subject to RCRA corrective action authority. This work plan and the attached supporting project plans establish the operable unit setting and the objectives, procedures, tasks, and schedule for conducting the RCRA facility investigation/corrective measures study (RFI/CMS) for the 100-NR-2 operable unit.

566 (DOE/RL-92-63-Rev.2) Richland Environmental Restoration Project, 1995 fiscal year work plan: Work breakdown structure 2.0. Revision 2. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1994. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007704. Source: OSTI; NTIS; INIS; GPO Dep.

Site Management System (SMS) guidance requires a Fiscal Year Work Plan (FYWP) to be prepared for the Richland Environmental Restoration (ER) Project. This revision is a complete update to cover the fiscal year (FY) 1995 time period. The DOE is committed to a 30-year goal of completing the assessment and remediation of inactive facilities and

sites on the Hanford Site that have been contaminated by various types of waste. Waste generated by Hanford Site nuclear reactors and chemical reprocessing plants has been treated, stored, and/or disposed of in a variety of ways. Some of the waste contains radioactive materials or hazardous chemical materials, but most of the waste material is mixed waste. The primary mission on the Hanford Site is waste management and environmental restoration and remediation. The ER Project was established in 1987 to plan, execute, and control the remediation efforts.

567 (DOE/RL-93-68-Rev.3) Interim remedial measure proposed plan for the 200-ZP-1 Operable Unit, Hanford, Washington. Revision 3. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States); Environmental Protection Agency, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008694. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes an interim action proposed in the 200-ZP-1 Operable Unit (OU) located in the 200 West Area of the Hanford site. Objective is to reduce further degradation of groundwater as a result of elevated concentrations of CCl_4 , CHCl_3 , and trichloroethylene in this OU. Comprehensive information on the contamination and the site is contained in documents and the Administrative Record, which are available at listed locations. The proposed plan and supporting documents are available at listed public repositories. Public participation (comments on the plan) are encouraged during October 17–November 30, 1994. Site risks are summarized, interim remedial action objectives are listed, and alternatives are described and compared, with the preferred alternative being given.

568 (DOE/RL-93-73) 300 Area Process Trenches Closure Plan. Luke, S.N. USDOE Richland Operations Office, WA (United States). 15 Aug 1994. 185p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018686. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1987, Westinghouse Hanford Company has been a major contractor to the US Department of Energy, Richland Operations Office and has served as co-operator of the 300 Area Process Trenches, the waste management unit addressed in this closure plan. For the purposes of the Resource Conservation and Recovery Act, Westinghouse Hanford Company is identified as "co-operator." The 300 Area Process Trenches Closure Plan (Revision 0) consists of a Resource Conservation and Recovery Act Part A Dangerous Waste Permit Application, Form 3 and a Resource Conservation and Recovery Act Closure Plan. An explanation of the Part A Permit Application, Form 3 submitted with this document is provided at the beginning of the Part A Section. The closure plan consists of nine chapters and six appendices. The 300 Area Process Trenches received dangerous waste discharges from research and development laboratories in the 300 Area and from fuels fabrication processes. This waste consisted of state-only toxic (WT02), corrosive (D002), chromium (D007), spent halogenated solvents (F001, F002, and F003), and spent nonhalogenated solvent (F005). Accurate records are unavailable concerning the amount of dangerous waste discharged to the trenches. The estimated annual quantity of waste (item IV.B) reflects the total quantity of both regulated and nonregulated waste water that was discharged to the unit.

569 (DOE/RL-94-21) **1994 Report on Hanford Site land disposal restrictions for mixed waste.** Black, D.G. USDOE Richland Operations Office, WA (United States). Apr 1994. 222p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94013580. Source: OSTI; NTIS; INIS; GPO Dep.

The baseline land disposal restrictions (LDR) plan was prepared in 1990 in accordance with the Hanford Federal Facility Agreement and Consent Order (commonly referred to as the Tri-Party Agreement) Milestone M-26-00 (Ecology et al. 1992). The text of this milestone is below. LDR requirements include limitations on storage of specified hazardous wastes (including mixed wastes). In accordance with approved plans and schedules, the US Department of Energy (DOE) shall develop and implement technologies necessary to achieve full compliance with LDR requirements for mixed wastes at the Hanford Site. LDR plans and schedules shall be developed with consideration at other action plan milestones and will not become effective until approved by the US Environmental Protection Agency (EPA) (or Washington State Department of Ecology [Ecology]) upon authorization to administer LDRs pursuant to Section 3006 of the Resource Conservation and Recovery Act of 1976 (RCRA). Disposal of LDR wastes at any time is prohibited except in accordance with applicable LDR requirements for nonradioactive wastes at all times. The plan will include, but not be limited to, the following: waste characterization plan; storage report; treatment report; treatment plan; waste minimization plan; a schedule depicting the events necessary to achieve full compliance with LDR requirements; a process for establishing interim milestones. The original plan was published in October 1990. This is the fourth of a series of annual updates required by Tri-Party Agreement Milestone M-26-01. A Tri-Party Agreement change request approved in March 1992 changed the annual due date from October to April and consolidated this report with a similar one prepared under Milestone M-25-00. The reporting period for this report is from April 1, 1993, to March 31, 1994.

570 (DOE/RL-94-24) **State waste discharge permit application, 200-E chemical drain field.** Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015763. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Hanford Federal Facility Agreement and Consent Order negotiations (Ecology et al. 1994), the US Department of Energy, Richland Operations Office, the US Environmental Protection Agency, and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground on the Hanford Site which affect groundwater or have the potential to affect ground would be subject to permitting under the structure of Chapter 173-216 (or 173-218 where applicable) of the Washington Administrative Code, the State Waste Discharge Permit Program. As a result of this decision, the Washington State Department of Ecology and the US Department of Energy, Richland Operations Office entered into Consent Order No. DE 91NM-177, (Ecology and DOE-RL 1991). The Consent Order No. DE 91NM-177 requires a series of permitting activities for liquid effluent discharges. This document presents the State Waste Discharge Permit (SWDP) application for the 200-E Chemical Drain Field. Waste water from the 272-E Building enters the process sewer line directly through a floor drain, while waste water from the 2703-E Building is collected in two floor drains, (north and south) that act as sumps and

are discharged periodically. The 272-E and 2703-E Buildings constitute the only discharges to the process sewer line and the 200-E Chemical Drain Field.

571 (DOE/RL-94-25) **State Waste Discharge Permit application: 200-E Powerhouse Ash Pit.** Atencio, B.P. USDOE Richland Operations Office, WA (United States). Jun 1994. 129p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94015379. Source: OSTI; NTIS; GPO Dep.

As part of the Hanford Federal Facility Agreement and Consent Order negotiations, the US Department and Energy, Richland Operations Office, the US Environmental Protection Agency, and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground on the Hanford Site which affect groundwater or have the potential to affect groundwater would be subject to permitting under the structure of Chapter 173-216 (or 173-218 where applicable) of the Washington Administrative Code, the State Waste Discharge Permit Program. This document constitutes the State Waste Discharge Permit application for the 200-E Powerhouse Ash Pit. The 200-E Powerhouse Ash Waste Water discharges to the 200-E Powerhouse Ash Pit via dedicated pipelines. The 200-E Ash Waste Water is the only discharge to the 200-E Powerhouse Ash Pit. The 200-E Powerhouse is a steam generation facility consisting of a coal-handling and preparation section and boilers.

572 (DOE/RL-94-26) **State Waste Discharge Permit application: 200-W Powerhouse Ash Pit.** Atencio, B.P. USDOE Richland Operations Office, WA (United States). Jun 1994. 130p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94015378. Source: OSTI; NTIS; GPO Dep.

As part of the Hanford Federal Facility Agreement and Consent Order negotiations; the US Department of Energy, Richland Operations Office, the US Environmental Protection Agency, and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground on the Hanford Site which affect groundwater or have the potential to affect groundwater would be subject to permitting under the structure of Chapter 173-216 (or 173-218 where applicable) of the Washington Administrative Code, the State Waste Discharge Permit Program. This document constitutes the State Waste Discharge Permit application for the 200-W Powerhouse Ash Pit. The 200-W Powerhouse Ash Waste Water discharges to the 200-W Powerhouse Ash Pit via dedicated pipelines. The 200-W Powerhouse Ash Waste Water is the only discharge to the 200-W Powerhouse Ash Pit. The 200-W Powerhouse is a steam generation facility consisting of a coal-handling and preparation section and boilers.

573 (DOE/RL-94-40) **Corrective action management unit application for the Environmental Restoration Disposal Facility.** Evans, G.C. USDOE Richland Operations Office, WA (United States). Jun 1994. 654p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014244. Source: OSTI; NTIS; INIS; GPO Dep.

Engineering drawings for this project are identified as CAPE-3081. Inquiries may be directed to: Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

The Environmental Restoration Disposal Facility (ERDF) is to accept both CERCLA (EPA-regulated) and RCRA (Ecology-regulated) remediation waste. The ERDF is considered part of the overall remediation strategy on the Hanford

Site, and as such, determination of ERDF viability has followed both RCRA and CERCLA decision making processes. Typically, determination of the viability of a unit, such as the ERDF, would occur as part of record of decision (ROD) or permit modification for each remediation site before construction of the ERDF. However, because construction of the ERDF may take a significant amount of time, it is necessary to begin design and construction of the ERDF before final RODs/permit modifications for the remediation sites. This will allow movement of waste to occur quickly once the final remediation strategy for the RCRA and CERCLA past-practice units is determined. Construction of the ERDF is a unique situation relative to Hanford Facility cleanup, requiring a Hanford Facility specific process be developed for implementing the ERDF that would satisfy both RCRA and CERCLA requirements. While the ERDF will play a significant role in the remediation process, initiation of the ERDF does not preclude the evaluation of remedial alternatives at each remediation site. To facilitate this, the January 1994 amendment to the Tri-Party Agreement recognizes the necessity for the ERDF, and the Tri-Party Agreement states: "Ecology, EPA, and DOE agree to proceed with the steps necessary to design, approve, construct, and operate such a ... facility." The Tri-Party Agreement requires the DOE-RL to prepare a comprehensive "package" for the EPA and Ecology to consider in evaluating the ERDF. The package is to address the criteria listed in 40 CFR 264.552(c) for corrective action management unit (CAMU) designation and a CERCLA ROD. This CAMU application is submitted as part of the Tri-Party Agreement-required information package.

574 (DOE/RL-94-45) Multipurpose explosive (MPX) drum-shaped packaging design criteria. USDOE Richland Operations Office, WA (United States). May 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013579. Source: OSTI; NTIS; INIS; GPO Dep.

In fiscal year 1993, the Transportation Management Division of the US Department of Energy sponsored an engineering study, completed by Westinghouse Hanford Company, to examine the viability of a generic packaging design able to satisfy multiple explosives packaging needs. Engineering study results indicated that a box-shaped and drum-shaped (allowable outer packaging shapes) multipurpose explosive (MPX) packaging would mitigate the impact of US Department of Transportation (DOT) Docket HM-181. The MPX packaging concept was for a multi-modal, reusable outer packaging to facilitate the transport of prepackaged solid explosives, most of which are in obsolete pre-HM-181 specification packagings, inside of the MPX packaging. This document sets forth the design criteria for the drum-shaped MPX packaging. These design criteria delineate minimum functional and regulation mandated requirements for the MPX drum-shaped packaging. Functional requirements are derived from US Department of Energy site personnel involved in explosives manufacturing and shipping. Regulatory requirements are derived from DOT and International Air Transport Association transport regulations, enabling the MPX packaging to be used by commercial carriers in either highway or air transportation modes.

575 (DOE/RL-94-55-Rev.1) Hanford analytical services quality assurance plan. Revision 1. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 142p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-76RL01830. (PNL-9803-Rev.1). Order Number DE95009997. Source: OSTI; NTIS; INIS; GPO Dep.

This document, the Hanford Analytical Services Quality Assurance Plan (HASQAP), is issued by the U.S. Department of Energy, Richland Operations Office (RL). The HASQAP establishes quality requirements in response to U.S. Department of Energy (DOE) Order 5700.6C, Quality Assurance (10 CFR 830.120, "Quality Assurance Requirements"). The HASQAP is designed to meet the needs of the RL for controlling the of analytical chemistry services provided by laboratory operations. The HASQAP is issued through the Analytical Services Branch of the Waste Management Division. The Analytical Services Branch is designated by the RL as having the responsibility for oversight management of laboratory operations under the Waste Management Division. The laboratories conduct sample analyses under several regulatory statutes, such as the Clean Air Act and the Clean Water Act. Sample analysis in support of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) is a major role of the laboratory operations.

576 (DOE/RL-94-81) Performance-oriented packaging: A guide to identifying, procuring, and using: Procurement and use of packaging using HM-181 regulations. USDOE Richland Operations Office, WA (United States). Sep 1994. 113p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018167. Source: OSTI; NTIS; INIS; GPO Dep.

This document addresses procurement of nonbulk packaging used for nonradioactive, hazardous materials that are transported by highway. The basic procedure is the same when making shipments by other modes. However, other sections of the regulations may affect the packaging requirements when shipping by other modes. The variation in requirements is extensive when air transportation is selected. A packaging engineer or transportation specialist should be contacted for guidance when transport is by a mode other than highway.

577 (DOE/RL-94-82) Performance-oriented packaging: A guide to identifying and designing: Identifying and designing hazardous materials packaging for compliance with post HM-181 DOT Regulations. Department of Energy, Richland, WA (United States). Richland Operations Office. Aug 1994. 110p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94019042. Source: OSTI; NTIS; INIS; GPO Dep.

With the initial publication of Docket HM-181 (hereafter referred to as HM-181), the U.S. Department of Energy (DOE), Headquarters, Transportation Management Division decided to produce guidance to help the DOE community transition to performance-oriented packagings (POP). As only a few individuals were familiar with the new requirements, elementary guidance was desirable. The decision was to prepare the guidance at a level easily understood by a novice to regulatory requirements. This document identifies design development strategies for use in obtaining performance-oriented packagings that are not readily available commercially. These design development strategies will be part of the methodologies for compliance with post HM-181 U.S. Department of Transportation (DOT) packaging regulations. This information was prepared for use by the DOE and its contractors. The document provides guidance for making decisions associated with designing performance-oriented packaging, and not for identifying specific material

or fabrication design details. It does provide some specific design considerations. Having a copy of the regulations handy when reading this document is recommended to permit a fuller understanding of the requirements impacting the design effort. While this document is not written for the packaging specialist, it does contain guidance important to those not familiar with the new POP requirements.

578 (DOE/RL-94-89) State waste discharge permit application: 400 Area secondary cooling water. USDOE Richland Operations Office, WA (United States). Dec 1992. 111p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016796. Source: OSTI; NTIS; INIS; GPO Dep.

This document constitutes the Washington Administrative Code 173-216 State Waste Discharge Permit Application that serves as interim compliance as required by the Consent Order DE 91NM-177, for the 400 Area Secondary Cooling Water stream. As part of the Hanford Federal Facility Agreement and Consent Order negotiations, the US Department of Energy, Richland Operations Office, the US Environmental Protection Agency, and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground on the Hanford Site which affect groundwater or have the potential to affect groundwater would be subject to permitting under the structure of Chapter 173-216 (or 173-218 where applicable) of the Washington Administrative Code, the State Waste Discharge Permitting Program. As a result of this decision, the Washington State Department of Ecology and the US Department of Energy, Richland Operations Office entered in to Consent Order DE 91NM-177. The Consent Order DE 91NM-177 requires a series of permitting activities for liquid effluent discharges.

579 (DOE/RL-94-97) Selection of analytical methods for mixed waste analysis at the Hanford Site. Morant, P.M. USDOE Richland Operations Office, WA (United States). Sep 1994. 39p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001639. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the process that the US Department of Energy (DOE), Richland Operations Office (RL) and contractor laboratories use to select appropriate or develop new or modified analytical methods. These methods are needed to provide reliable mixed waste characterization data that meet project-specific quality assurance (QA) requirements while also meeting health and safety standards for handling radioactive materials. This process will provide the technical basis for DOE's analysis of mixed waste and support requests for regulatory approval of these new methods when they are used to satisfy the regulatory requirements of the Hanford Federal Facility Agreement and Consent Order (Tri-party Agreement) (Ecology et al. 1992).

580 (DOE/RL-94-103-Vol.1) Richland Environmental Restoration Project 1995 fiscal year work plan: Work breakdown structure 2.0, 100 Area. Volume 1. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008193. Source: OSTI; NTIS; INIS; GPO Dep.

The 100 Area RA Program is responsible for the interim management and disposition of past-practice environmental contamination on the Hanford Site. This includes contaminated soils, contaminated ground water, and solid waste contained in past-practice units that have been inactive since March 1, 1987. Also included is a RCRA treatment,

storage, and disposal (TSD) waste unit located in the 100 Area. A majority of the work entails waste identification and characterization feasibility studies for remedial design and cleanup, technology development and demonstration, D&D of inactive facilities, and postclosure activities. The emphasis is to bring all known waste sites on the Hanford Site into compliance with applicable Federal, State and local environmental laws and regulations.

581 (DOE/RL-94-103-Vol.2) Richland Environmental Restoration Project 1995 fiscal year work plan: Work breakdown structure 2.0, 200/300 Area. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 183p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008194. Source: OSTI; NTIS; INIS; GPO Dep.

The Richland Environmental Restoration Project 1995 Fiscal Year Work Plan, Work Breakdown Structure 2.0 for the 200/300 Area outlines project objectives, project schedules, and associated costs for the various monitoring, remedial action, and waste management activities which are required for the 200/300 Areas on the Hanford Reservation Site for fiscal year 1995. The emphasis is to bring all known waste sites on the Hanford Site into compliance with applicable Federal, State, and local environmental laws and regulations. The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) is the major regulatory driver.

582 (DOE/RL-94-103-Vol.3) Richland Environmental Restoration Project 1995 fiscal year work plan: Work breakdown structure 2.0, program management. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008195. Source: OSTI; NTIS; INIS; GPO Dep.

The 100 Area RA Program is responsible for the interim management and disposition of past-practice environmental contamination on the Hanford Site. This includes contaminated soils, contaminated ground water, and solid waste contained in past-practice units that have been inactive since March 1, 1987. The Program Management and Support (PM&S) program encompasses remedial action (RA) management workscopes. This appendix contains the following: Program statements; Program objectives; Assumptions and constraints; Work breakdown structure (WBS); Schedule; and, Fiscal information.

583 (DOE/RL-94-103-Vol.4) Richland Environmental Restoration Project 1995 fiscal year work plan: Work breakdown structure 2.0, 1100 Area. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008196. Source: OSTI; NTIS; INIS; GPO Dep.

The 1100 Area of the Hanford Reservation is comprised of four Operable Units (OUs). The 1100-EM-1 OU has an approved work plan outlining the traditional multiphase remedial investigation/feasibility study (RI/FS) process. The assessment activities for the remaining three 1100 Area OUs have been negotiated and agreed upon between the DOE, the EPA, and the Washington State Department of Ecology. Work efforts included a limited filed investigation and a focused feasibility study used as an addendum to the 1100-EM-1 OU documentation. One 1100 Area record of decision was issued by the EPA. The 1100-EM-2, 1100-EM-3, and 1100-IU-1 remediation efforts are at the observational

characterization stage. In fiscal year 1995, remedial work will be performed in the other three OUs.

584 (DOE/RL-364162-Vol.2) **Solid Waste Operations Complex W-113: Preliminary design drawings. Volume 2.** Westinghouse Hanford Co., Richland, WA (United States); Raytheon Engineers and Constructors, Inc., Philadelphia, PA (United States). Jan 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Subcontract MJJ-SVV-364162. Source: OSTI.

Engineering drawings are presented for the solid waste retrieval facilities at the Hanford Site. Process flowsheets are also presented.

585 (EGG-2679(93)) **Environmental surveillance for EG&G Idaho Waste Management facilities at the Idaho National Engineering Laboratory: 1993 annual report.** Wilhelmsen, R.N.; Wright, K.C.; McBride, D.W.; Borsella, B.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94016919. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes calendar year 1993 environmental surveillance activities of Environmental Monitoring of EG&G Idaho, Inc., performed at EG&G Idaho operated Waste Management facilities at the Idaho National Engineering Laboratory (INEL). The major facilities monitored include the Radioactive Waste Management Complex, the Waste Experimental Reduction Facility, the Mixed Waste Storage Facility, and two surplus facilities. Included are results of the sampling performed by the Radiological and Environmental Sciences Laboratory and the United States Geological Survey. The primary purposes of monitoring are to evaluate environmental conditions, to provide and interpret data, to ensure compliance with applicable regulations or standards, and to ensure protection of human health and the environment. This report compares 1993 environmental surveillance data with US Department of Energy derived concentration guides and with data from previous years.

586 (EGG-CEE-10883) **Remediation application strategies for depleted uranium contaminated soils at the US Army Yuma Proving Ground.** Vandel, D.S.; Medina, S.M.; Weidner, J.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 221p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94010710. Source: OSTI; NTIS; INIS; GPO Dep.

The US Army Yuma Proving Ground (YPG), located in the southwest portion of Arizona conducts firing of projectiles into the Gunpoint (GP-20) firing range. The penetrators are composed of titanium and DU. The purpose of this project was to determine feasible cleanup technologies and disposal alternatives for the cleanup of the depleted uranium (DU) contaminated soils at YPG. The project was split up into several tasks that include (a) collecting and analyzing samples representative of the GP-20 soils, (b) evaluating the data results, (c) conducting a literature search of existing proven technologies for soil remediation, and (d) making final recommendations for implementation of this technology to the site. As a result of this study, several alternatives for the separation, treatment, and disposal procedures are identified that would result in meeting the cleanup levels defined by the Nuclear Regulatory Commission for unrestricted use of soils and would result in a significant cost savings over the life of the firing range.

587 (EGG-M-94040) **A sensitivity study of an evaluation of alternatives for disposal of INEL low-level waste and low-level mixed waste.** Roesener, W.S.; Smith, T.H.; Jorgenson-Waters, M.J.; Sherick, M.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940225-127: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 Mar 1994). Order Number DE95005020. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents insights gained from an informal sensitivity study of an evaluation of disposal alternatives for Idaho National Engineering Laboratory low-level waste and low-level mixed waste. The insights relate to the sensitivity of the alternative rankings to changes in assumptions identified as "key uncertainties". The result of the sensitivity study is that significant changes occur in the rankings when selected "key uncertainties" are varied over reasonable ranges. Three alternatives involving the use of (a) shallow land burial and boreholes or (b) greater-depth burial and boreholes rank high for all cases investigated. The other alternatives rank low in some or all cases.

588 (EGG-M-94073) **Method of characterizing void volume headspace in vented transuranic waste sludge drums using limited sampling data.** Liekhus, K.J. (EG&G Idaho, Inc., Idaho Falls, ID (United States)); Connolly, M.J.; Arnold, P.M.; O'Leary, G.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940815-106: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005025. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy must demonstrate to the Environmental Protection Agency that a drum headspace sample is representative of the volatile organic compounds (VOCs) within the entire void space of the waste container in order to demonstrate compliance in the future when drums could be directly emplaced in the Waste Isolation Pilot Plant in New Mexico. A test program is underway at the Idaho National Engineering Laboratory to determine if the drum headspace VOC concentration is representative of the concentration in the entire drum void space and demonstrate that the VOC concentration in the void space of each layer of confinement can be estimated using a model incorporating diffusive and permeative transport principles and limited waste drum sampling data. A comparison of model predictions of VOC concentration in the innermost layer of confinement with actual measurement from transuranic waste sludge drums demonstrate that the model may be useful in characterizing VOC concentration throughout entire drum void volume.

589 (EGG-M-94219) **Integrated approach to hazardous and radioactive waste remediation.** Hyde, R.A.; Reece, W.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-950232-9: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95002046. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy Office of Technology Development is supporting the demonstration, and evaluation of a suite of waste retrieval technologies. An integration of

leading-edge technologies with commercially available baseline technologies will form a comprehensive system for effective and efficient remediation of buried waste throughout the complex of DOE nuclear facilities. This paper discusses the complexity of systems integration, addressing organizational and engineering aspects of integration as well as the impact of human operators, and the importance of using integrated systems in remediating buried hazardous and radioactive waste.

590 (EGG-M-94273) Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data. Liekhus, K.J. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Vaughn, M.E.; Jensen, B.A.; Connolly, M.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9409178-9: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95002030. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of transuranic waste destined for the Waste Isolation Pilot Plant currently requires detailed characterization of the volatile organic compound (VOC) concentration in the void volume headspaces (drum headspace, the large polymer bag headspace, and the innermost layers of confinement headspace) of the waste drums. A test program is underway at the Idaho National Engineering Laboratory (INEL) to determine if the drum headspace VOC concentration is representative of the concentration in the entire drum void space and demonstrate that the VOC concentration in the innermost layer of confinement can be estimated using a model incorporating diffusion and permeation transport principles and limited waste drum sampling data. A comparison of model predictions of VOC concentration in the innermost layer of confinement with actual measurement from transuranic waste drums demonstrate that this method may be useful in characterizing VOC concentration in a vented waste drum.

591 (EGG-M-94275) Cost and quality effectiveness of objective-based and statistically-based quality control for volatile organic compounds analyses of gases. Bennett, J.T.; Crowder, C.A.; Connolly, M.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940790-5: 10. annual waste testing and quality assurance symposium, Arlington, VA (United States), 11-15 Jul 1994). Order Number DE95005026. Source: OSTI; NTIS; INIS; GPO Dep.

Gas samples from drums of radioactive waste at the Department of Energy (DOE) Idaho National Engineering Laboratory are being characterized for 29 volatile organic compounds to determine the feasibility of storing the waste in DOE's Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. Quality requirements for the gas chromatography (GC) and GC/mass spectrometry chemical methods used to analyze the waste are specified in the Quality Assurance Program Plan for the WIPP Experimental Waste Characterization Program. Quality requirements consist of both objective criteria (data quality objectives, DQOs) and statistical criteria (process control). The DQOs apply to routine sample analyses, while the statistical criteria serve to determine and monitor precision and accuracy (P&A) of the analysis methods and are also used to assign upper confidence limits to measurement results close to action levels.

After over two years and more than 1000 sample analyses there are two general conclusions concerning the two approaches to quality control: (1) Objective criteria (e.g., $\pm 25\%$ precision, $\pm 30\%$ accuracy) based on customer needs and the usually prescribed criteria for similar EPA- approved methods are consistently attained during routine analyses. (2) Statistical criteria based on short term method performance are almost an order of magnitude more stringent than objective criteria and are difficult to satisfy following the same routine laboratory procedures which satisfy the objective criteria. A more cost effective and representative approach to establishing statistical method performances criteria would be either to utilize a moving average of P&A from control samples over a several month time period or to determine within a sample variation by one-way analysis of variance of several months replicate sample analysis results or both. Confidence intervals for results near action levels could also be determined by replicate analysis of the sample in question.

592 (EGG-M-94302) Overview of commercial low-level radioactive waste disposal in the United States. Smith, P. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940748-98: 35. annual meeting of the Institute of Nuclear Materials Management (INMM), Naples, FL (United States), 17-20 Jul 1994). Order Number DE95005024. Source: OSTI; NTIS; INIS; GPO Dep.

Disposal of commercial low-level radioactive waste (LLW) is a critical part of the national infrastructure needed to maintain the health of American businesses, universities, and hospitals. Currently only 19 States (located in the Northwest and Southeast) have access to operating disposal facilities; all other States are storing their LLW until they open new disposal facilities on their own or in concert with other States through regional compact agreements. In response to recommendations from the National Governors Association, Congress assigned the burden for LLW disposal to all States, first in 1980 through Public Law 96-573, the "Low-level Radioactive Waste Policy Act", and again in 1986 through Public Law 99-240, the "Low-Level Radioactive Waste Policy Amendments Act of 1985". As directed by Congress, the Department of Energy provides technical assistance to States and compact regions with this task. After almost 14 years, nine compact regions have been ratified by Congress; California, Texas, North Carolina, and Nebraska have submitted license applications; California has issued an operating license; and the number of operating disposal facilities has decreased from three to two.

593 (EGG-M-94401) Viscosity-based high temperature waste form compositions. Reimann, G.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9409178-14: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95005038. Source: OSTI; NTIS; INIS; GPO Dep.

High-temperature waste forms such as iron-enriched basalt are proposed to immobilize and stabilize a variety of low-level wastes stored at the Idaho National Engineering Laboratory. The combination of waste and soil anticipated for the waste form results in high $\text{SiO}_2 + \text{Al}_2\text{O}_3$ producing a viscous melt in an arc furnace. Adding a flux such as CaO to adjust the basicity ratio (the molar ratio of basic to acid

oxides) enables tapping the furnace without resorting to extreme temperatures, but adds to the waste volume. Improved characterization of wastes will permit adjusting the basicity ratio to between 0.7 and 1.0 by blending of wastes and/or changing the waste-soil ratio. This minimizes waste form volume. Also, lower pouring temperatures will decrease electrode and refractory attrition, reduce vaporization from the melt, and, with suitable flux, facilitate crystallization. Results of laboratory tests were favorable and pilot-scale melts are planned; however, samples have not yet been subjected to leach testing.

594 (EGG-MS-10941) Modified IRC bench-scale arc melter for waste processing. Eddy, T.L.; Sears, J.W.; Grandy, J.D.; Kong, P.C.; Watkins, A.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015316. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the INEL Research Center (IRC) arc melter facility and its recent modifications. The arc melter can now be used to study volatilization of toxic and high vapor pressure metals and the effects of reducing and oxidizing (redox) states in the melt. The modifications include adding an auger feeder, a gas flow control and monitoring system, an offgas sampling and exhaust system, and a bag-house filter system, as well as improving the electrode drive, slag sampling system, temperature measurement and video monitoring and recording methods, and oxidation lance. In addition to the volatilization and redox studies, the arc melter facility has been used to produce a variety of glass/ceramic waste forms for property evaluation. Waste forms can be produced on a daily basis. Some of the melts performed are described to illustrate the melter's operating characteristics.

595 (EGG-MS-11147) Radioactive waste shredding: Preliminary evaluation. Soelberg, N.R.; Reimann, G.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94017607. Source: OSTI; NTIS; INIS; GPO Dep.

The critical constraints for sizing solid radioactive and mixed wastes for subsequent thermal treatment were identified via a literature review and a survey of shredding equipment vendors. The types and amounts of DOE radioactive wastes that will require treatment to reduce the waste volume, destroy hazardous organics, or immobilize radionuclides and/or hazardous metals were considered. The preliminary steps of waste receipt, inspection, and separation were included because many potential waste treatment technologies have limits on feedstream chemical content, physical composition, and particle size. Most treatment processes and shredding operations require at least some degree of feed material characterization. Preliminary cost estimates show that pretreatment costs per unit of waste can be high and can vary significantly, depending on the processing rate and desired output particle size.

596 (EGG-MS-11211-Vol.1) Integrated thermal treatment system study: Phase 1 results: Volume 1. Feizollahi, F.; Quapp, W.J.; Hempill, H.G.; Groffie, F.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 216p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94017609. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated systems engineering approach is used for uniform comparison of widely varying thermal treatment

technologies proposed for management of contact-handled mixed low-level waste (MLLW) currently stored in the US Department of Energy complex. Ten different systems encompassing several incineration design options are studied. All subsystems, including facilities, equipment, and methods needed for integration of each of the ten systems are identified. Typical subsystems needed for complete treatment of MLLW are incoming waste receiving and preparation (characterization, sorting, sizing, and separation), thermal treatment, air pollution control, primary and secondary stabilization, metal decontamination, metal melting, mercury recovery, lead recovery, and special waste and aqueous waste treatment. The evaluation is performed by developing a preconceptual design package and planning life-cycle cost (PLCC) estimates for each system. As part of the preconceptual design process, functional and operational requirements, flow sheets and mass balances, and conceptual equipment layouts are developed for each system. The PLCC components estimated are technology development, production facility construction, pre-operation, operation and maintenance, and decontamination and decommissioning. Preconceptual design data and other technology information gathered during the study are examined and areas requiring further development, testing, and evaluation are identified and recommended. Using a qualitative method, each of the ten systems are ranked.

597 (EGG-MS-11211-Vol.2) Integrated thermal treatment system study: Phase 1 results: Appendix B, Flow sheets and material balances: Volume 2. Feizollahi, F.; Quapp, W.J.; Hempill, H.G.; Groffie, F.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94017610. Source: OSTI; NTIS; INIS; GPO Dep.

This document accompanies a full report which describes the testing and evaluation of ten different methods for incinerating mixed low-level radioactive wastes. It consists of flowsheets and diagrams of a rotary kiln, pyrolysis methods, a plasma furnace, a fixed hearth, and thermal desorption methods.

598 (EGG-MS-11297) Depleted uranium disposal options evaluation. Hertzler, T.J. (Science Applications International Corp., Idaho Falls, ID (United States)). Waste Management Technology Div.; Nishimoto, D.D.; Otis, M.D. EG and G Idaho, Inc., Idaho Falls, ID (United States); Science Applications International Corp., Idaho Falls, ID (United States). Waste Management Technology Div. May 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002029. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE), Office of Environmental Restoration and Waste Management, has chartered a study to evaluate alternative management strategies for depleted uranium (DU) currently stored throughout the DOE complex. Historically, DU has been maintained as a strategic resource because of uses for DU metal and potential uses for further enrichment or for uranium oxide as breeder reactor blanket fuel. This study has focused on evaluating the disposal options for DU if it were considered a waste. This report is in no way declaring these DU reserves a "waste," but is intended to provide baseline data for comparison with other management options for use of DU. To PICS considered in this report include: Retrievable disposal; permanent disposal; health hazards; radiation toxicity and chemical toxicity.

599 (EGG-MS-11303) Quantities and characteristics of the contact-handled low-level mixed waste streams for the DOE complex. Huebner, T.L. (SAIC, Idaho Falls, ID (United States). Waste Management Technology Div.); Wilson, J.M.; Ruhter, A.H.; Bonney, S.J. EG and G Idaho, Inc., Idaho Falls, ID (United States); Science Applications International Corp., Idaho Falls, ID (United States). Waste Management Technology Div. Aug 1994. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95000333. Source: OSTI; NTIS; INIS; GPO Dep.

This report supports the Integrated Thermal Treatment System (ITTS) Study initiated by the Department of Energy (DOE) Office of Technology Development (EM-50), which is a system engineering assessment of a variety of mixed waste treatment process. The DOE generates and stores large quantities of mixed wastes that are contaminated with both chemically hazardous and radioactive species. The treatment of these mixed wastes requires meeting the standards established by the Environmental Protection Agency for the specific hazardous contaminants regulated under the Resource Conservation and Recovery Act while also providing adequate control of the radionuclides. The thrust of the study is to develop preconceptual designs and life-cycle cost estimates for integrated thermal treatment systems ranging from conventional incinerators, such as rotary kiln and controlled air systems, to more innovative but not yet established technologies, such as molten salt and molten metal waste destruction systems. Prior to this engineering activity, the physical and chemical characteristics of the DOE low-level mixed waste streams to be treated must be defined or estimated. This report describes efforts to estimate the DOE waste stream characteristics.

600 (EGG-MS-11400) Depleted uranium concrete container feasibility study. Haelsig, R.T. (Packaging Technology, Inc., Tacoma, WA (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95000332. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to consider the feasibility of using containers constructed of depleted uranium aggregate concrete (DUCRETE) to store and transport radioactive materials. The method for this study was to review the advantages and disadvantages of DUCRETE containers considering design requirements for potential applications. The author found that DUCRETE is a promising material for onsite storage containers, provided DUCRETE vessels can be certified for one-way transport to disposal sites. The author also found that DUCRETE multipurpose spent nuclear fuel storage/transport packages are technically viable, provided altered temperature acceptance limits can be developed for DUCRETE.

601 (EGG-MS-11416) Depleted uranium management alternatives. Hertzler, T.J.; Nishimoto, D.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94017608. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates two management alternatives for Department of Energy depleted uranium: continued storage as uranium hexafluoride, and conversion to uranium metal and fabrication to shielding for spent nuclear fuel containers. The results will be used to compare the costs with other

alternatives, such as disposal. Cost estimates for the continued storage alternative are based on a life-cycle of 27 years through the year 2020. Cost estimates for the recycle alternative are based on existing conversion process costs and Capital costs for fabricating the containers. Additionally, the recycle alternative accounts for costs associated with intermediate product resale and secondary waste disposal for materials generated during the conversion process.

602 (EGG-MS-11420) Properties of vitrified Rocky Flats TRUW with different waste loadings. Eddy, T.L.; Sears, J.W.; Grandy, J.D.; Miley, D.V.; Erickson, A.W.; Fransworth, R.N.; Larsen, E.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002041. Source: OSTI; NTIS; INIS; GPO Dep.

One of the major waste streams at the Idaho National Laboratory (INEL) is a combination of the Rocky Flats Plant 1st and 2nd stage sludges (hydrated metal oxides or H-series), which constitutes about 20 wt % of the buried waste. A similar mass fraction is in interim storage. The buried waste is commingled with about five times as much soil that has become contaminated as the containers have deteriorated. The purpose of this paper is to report on waste form property variations of the H-series waste melted with various fractions of soil, plus volatile and hazardous metals and transuranic surrogates. Optimally, the waste form will minimize the bulk leach rate, maximize the volume reduction, minimize the additives needed, and stabilize the transuranic nuclides. Topics to be discussed include the input and final compositions, the melting and crystallization processes, the test results, and conclusions.

603 (EGG-NRE-11451) SWEPP Gamma-Ray Spectrometer System software design description. Femec, D.A.; Killian, E.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 391p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002035. Source: OSTI; NTIS; INIS; GPO Dep.

To assist in the characterization of the radiological contents of contract-handled waste containers at the Stored Waste Examination Pilot Plant (SWEPP), the SWEPP Gamma-Ray Spectrometer (SGRS) System has been developed by the Radiation Measurements and Development Unit of the Idaho National Engineering Laboratory. The SGRS system software controls turntable and detector system activities. In addition to determining the concentrations of gamma-ray-emitting radionuclides, this software also calculates attenuation-corrected isotopic mass ratios of specific interest. This document describes the software design for the data acquisition and analysis software associated with the SGRS system.

604 (EGG-NRE-11452) SWEPP gamma-ray spectrometer system software user's guide. Femec, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002005. Source: OSTI; NTIS; INIS; GPO Dep.

The SWEPP Gamma-Ray Spectrometer (SGRS) System has been developed by the Radiation Measurement and Development Unit of the Idaho National Engineering Laboratory to assist in the characterization of the radiological contents of contact-handled waste containers at the Stored Waste Examination Pilot Plant (SWEPP). In addition to

determining the concentrations of gamma-ray-emitting radionuclides, the software also calculates attenuation-corrected isotopic mass ratios of specific interest, and provides controls for SGRS hardware as required. This document serves as a user's guide for the data acquisition and analysis software associated with the SGRS system.

605 (EGG-NRE-11457) SWEPP gamma-ray spectrometer system software test plan and report. Femec, D.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95005044. Source: OSTI; NTIS; INIS; GPO Dep.

The SWEPP Gamma-Ray Spectrometer (SGRS) System has been developed by the Radiation Measurements and Development Unit of the Idaho National Engineering Laboratory to assist in the characterization of the radiological contents of contact-handled waste containers at the Stored Waste Examination Pilot Plant (SWEPP). In addition to determining the concentrations of gamma-ray-emitting radionuclides, the software also calculates attenuation-corrected isotopic mass ratios of specific interest, and provides controls for SGRS hardware as required. This document presents the test plan and report for the data acquisition and analysis software associated with the SGRS system.

606 (EGG-RWMC-11189) Radiological, physical, and chemical characterization of low-level alpha contaminated wastes stored at the Idaho National Engineering Laboratory. Apel, M.L.; Becker, G.K.; Ragan, Z.K.; Frasure, J.; Raivo, B.D.; Gale, L.G.; Pace, D.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 688p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015315. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides radiological, physical, and chemical characterization data for low-level alpha-contaminated radioactive and low-level alpha-contaminated radioactive and hazardous (i.e., mixed) wastes stored at the Idaho National Engineering Laboratory and considered for treatment under the Private Sector Participation Initiative Program. Waste characterization data are provided in the form of INEL Waste Profile Sheets. These documents provide, for each content code, information on waste identification, waste description, waste storage configuration, physical/chemical waste composition, radionuclide and associated alpha activity waste characterization data, and hazardous constituents present in the waste. Information is provided for 97 waste streams which represent an estimated total volume of 25,450 m³ corresponding to a total mass of approximately 12,000,000 kg. In addition, considerable information concerning alpha, beta, gamma, and neutron source term data specific to Rocky Flats-generated waste forms stored at the INEL are provided to assist in facility design specification.

607 (EGG-WM-8773) Radioactive Waste Management Complex low-level waste radiological performance assessment. Maheras, S.J.; Rood, A.S.; Magnuson, S.O.; Sussman, M.E.; Bhatt, R.N. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 458p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94016278. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the projected radiological dose impacts associated with the disposal of radioactive low-level

waste at the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory. This radiological performance assessment was conducted to evaluate compliance with applicable radiological criteria of the US Department of Energy and the US Environmental Protection Agency for protection of the public and the environment. The calculations involved modeling the transport of radionuclides from buried waste, to surface soil and subsurface media, and eventually to members of the public via air, groundwater, and food chain pathways. Projections of doses were made for both offsite receptors and individuals inadvertently intruding onto the site after closure. In addition, uncertainty and sensitivity analyses were performed. The results of the analyses indicate compliance with established radiological criteria and provide reasonable assurance that public health and safety will be protected.

608 (EGG-WM-10962) Interim report: Waste management facilities cost information for mixed low-level waste. Feizollahi, F.; Shropshire, D. Idaho National Engineering Lab., Idaho Falls, ID (United States). Mar 1994. 302p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95009458. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains preconceptual designs and planning level life-cycle cost estimates for treating alpha and non-alpha mixed low-level radioactive waste. This report contains information on twenty-seven treatment, storage, and disposal modules that can be integrated to develop total life cycle costs for various waste management options. A procedure to guide the US Department of Energy and its contractor personnel in the use of estimating data is also summarized in this report.

609 (EGG-WM-11049) Aggradational and erosional history of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory. Dechert, T.V. (Idaho Univ., Moscow, ID (United States)); McDaniel, P.A.; Falen, A.L. EG and G Idaho, Inc., Idaho Falls, ID (United States); Idaho Univ., Moscow, ID (United States). Sep 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002018. Source: OSTI; NTIS; INIS; GPO Dep.

Long-term performance of the low-level waste disposal site at the Radioactive Waste Management Complex (RWMC) is partially dependent on the stability of the land surface with respect to erosion of cover materials. This document discusses the aggradational and erosional history of the naturally occurring sediments and soils in and around the RWMC, focusing on the late-Pleistocene and Holocene epochs. Other related issues include the ages of the various deposits, the extent to which they have been altered by soil formation and other processes, their relationships to the basalt flows in the area, and the impact of human activity on the materials at the RWMC.

610 (EGG-WM-11105) Operational readiness review for the Waste Experimental Reduction Facility: Final report. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1993. 511p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008526. Source: OSTI; NTIS; INIS; GPO Dep.

An Operational Readiness Review (ORR) at the Idaho National Engineering Laboratory's (INEL's) Waste Experimental Reduction Facility (WERF) was conducted by EG&G

Idaho, Inc., to verify the readiness of WERF to resume operations following a shutdown and modification period of more than two years. It is the conclusion of the ORR Team that, pending satisfactory resolution of all pre-startup findings, WERF has achieved readiness to resume unrestricted operations within the approved safety basis. ORR appraisal forms are included in this report.

611 (EGG-WM-11342) Project report for the commercial disposal of mixed low-level waste debris. Andrews, G.; Balls, V.; Shea, T.; Thiesen, T. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1994. 450p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001905. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the basis for the commercial disposal of Idaho National Engineering Laboratory (INEL) mixed low-level waste (MLLW) debris and the associated activities. Mixed waste is radioactive waste plus hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). The critical factors for this project were DOE 5820.2A exemption, contracting mechanism, NEPA documentation, sampling and analysis, time limitation and transportation of waste. This report also will provide a guide or a starting place for future use of Envirocare of Utah or other private sector disposal/treatment facilities, and the lessons learned during this project.

612 (EGG-WROC-11148) Hazards assessment for the Hazardous Waste Storage Facility. Knudsen, J.K.; Calley, M.B. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015321. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the hazards assessment for the Hazardous Waste Storage Facility (HWSF) located at the Idaho National Engineering Laboratory. The hazards assessment was performed to ensure that this facility complies with DOE and company requirements pertaining to emergency planning and preparedness for operational emergencies. The hazards assessment identifies and analyzes hazards that are significant enough to warrant consideration in a facility's operational emergency management program. The area surrounding HWSF, the buildings and structures at HWSF, and the processes used at HWSF are described in this report. All nonradiological hazardous materials at the HWSF were identified (radiological hazardous materials are not stored at HWSF) and screened against threshold quantities according to DOE Order 5500.3A guidance. Two of the identified hazardous materials exceeded their specified threshold quantity. This report discusses the potential release scenarios and consequences associated with an accidental release for each of the two identified hazardous materials, lead and mercury. Emergency considerations, such as emergency planning zones, emergency classes, protective actions, and emergency action levels, are also discussed based on the analysis of potential consequences. Evaluation of the potential consequences indicated that the highest emergency class for operational emergencies at the HWSF would be a Site Area Emergency.

613 (EGG-WTD-10640) Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory. Shaw, P. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Anderson, B.; Davis, D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1993. 50p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002048. Source: OSTI; NTIS; INIS; GPO Dep.

INEL has radiologically contaminated nitrate salt and soil waste stored above and below ground in Pad A and the Acid Pit at the Radioactive Waste Management Complex. Pad A contain uranium and transuranic contaminated potassium and sodium nitrate salts generated from dewatered waste solutions at the Rocky Flats Plant. The Acid Pit was used to dispose of liquids containing waste mineral acids, uranium, nitrate, chlorinated solvents, and some mercury. Ex situ vitrification is a high temperature destruction of nitrates and organics and immobilizes hazardous and radioactive metals. Laboratory scale melting of actual radionuclides containing INEL Pad A nitrate salts and Acid Pit soils was performed. The salt/soil/additive ratios were varied to determine the range of glass compositions (resulted from melting different wastes); maximize mass and volume reduction, durability, and immobilization of hazardous and radioactive metals; and minimize viscosity and offgas generation for wastes prevalent at INEL and other DOE sites. Some mixtures were spiked with additional hazardous and radioactive metals. Representative glasses were leach tested and showed none. Samples spiked with transuranic showed low nuclide leaching. Wasteforms were two to three times bulk densities of the salt and soil. Thermally co-processing soils and salts is an effective remediation method for destroying nitrate salts while stabilizing the radiological and hazardous metals they contain. The measured durability of these low-level waste glasses approached those of high-level waste glasses. Lab scale vitrification of actual INEL contaminated salts and soils was performed at General Atomics Laboratory as part of the INEL Waste Technology Development and Environmental Restoration within the Buried Waste Integrated Demonstration Program.

614 (EGG-WTD-11137) Evaluation of pretreatment processes for supercritical water oxidation. Barnes, C.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002047. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates processes to chemically treat US Department of Energy wastes to remove organic halogens, phosphorus, and sulfur. Chemical equilibrium calculations, process simulations, and responses from developers and licensors form the basis for comparisons. Gas-phase catalytic hydrogenation processes, strong base and base catalyzed processes, high pressure hydrolysis, and other emerging or commercial dehalogenation processes (both liquid and mixed phase) were considered. Cost estimates for full-scale processes and demonstration testing are given. Based on the evaluation, testing of a hydrogenation process and a strong base process are recommended.

615 (EGG-WTD-11156) Buried waste integrated demonstration FY 94 deployment plan. Hyde, R.A.; Walker, S.; Garcia, M.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001904. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) is a program funded by the U.S. Department of Energy Office of Technology Development. BWID supports the applied research, development, demonstration, testing, and evaluation of a suite of advanced technologies that together form a

comprehensive remediation system for the effective and efficient remediation of buried waste. The fiscal year (FY) 1994 effort will fund thirty-eight technologies in five areas of buried waste site remediation: site characterization, waste characterization, retrieval, treatment, and containment/stabilization. This document is the basic operational planning document for deployment of all BWID projects. Discussed in this document are the BWID preparations for INEL field demonstrations, INEL laboratory demonstrations, non-INEL demonstrations, and paper studies. Each technology performing tests will prepare a test plan to detail the specific procedures, objectives, and tasks of each test. Therefore, information specific to testing each technology is intentionally omitted from this document.

616 (EGG-WTD-11199) Design requirements for the supercritical water oxidation test bed. Svoboda, J.M.; Valentich, D.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015260. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the design requirements for the supercritical water oxidation (SCWO) test bed that will be located at the Idaho National Engineering Laboratory (INEL). The test bed will process a maximum of 50 gph of waste plus the required volume of cooling water. The test bed will evaluate the performance of a number of SCWO reactor designs. The goal of the project is to select a reactor that can be scaled up for use in a full-size waste treatment facility to process US Department of Energy mixed wastes. EG&G Idaho, Inc. will design and construct the SCWO test bed at the Water Reactor Research Test Facility (WRRTF), located in the northern region of the INEL. Private industry partners will develop and provide SCWO reactors to interface with the test bed. A number of reactor designs will be tested, including a transpiring wall, tube, and vessel-type reactor. The initial SCWO reactor evaluated will be a transpiring wall design. This design requirements report identifies parameters needed to proceed with preliminary and final design work for the SCWO test bed. A flow sheet and Process and Instrumentation Diagrams define the overall process and conditions of service and delineate equipment, piping, and instrumentation sizes and configuration Codes and standards that govern the safe engineering and design of systems and guidance that locates and interfaces test bed hardware are provided. Detailed technical requirements are addressed for design of piping, valves, instrumentation and control, vessels, tanks, pumps, electrical systems, and structural steel. The approach for conducting the preliminary and final designs and environmental and quality issues influencing the design are provided.

617 (EGG-WTD-11271) Supercritical water oxidation test bed effluent treatment study. Barnes, C.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015261. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents effluent treatment options for a 50 h Supercritical Water Test Unit. Effluent compositions are calculated for eight simulated waste streams, using different assumed cases. Variations in effluent composition with different reactor designs and operating schemes are discussed. Requirements for final effluent compositions are briefly reviewed. A comparison is made of two general schemes. The

first is one in which the effluent is cooled and effluent treatment is primarily done in the liquid phase. In the second scheme, most treatment is performed with the effluent in the gas phase. Several unit operations are also discussed, including neutralization, mercury removal, and evaporation.

618 (EGG-WTD-11403) Evaluation of the Brinecell® electrochemical oxidation unit for destruction of noncyanide strippers and other colored compounds in wastewaters. Wikoff, P.M.; Suci, D.F. Environmental Research and Development, Inc., Idaho Falls, ID (United States). Aug 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002036. Source: OSTI; NTIS; INIS; GPO Dep.

The noncyanide strippers used in the plating operations at Kelly Air Force Base, in San Antonio, Texas, develop an intense red color during use. Currently, the spent strippers cannot be treated in the Industrial Wastewater Treatment Plant because, even after biological treatment, the color remains too high for discharge. The Brinecell® process was evaluated for its application in treating the spent stripping solutions. The Brinecell® produces strong oxidizing agents that could treat the color causing compounds. The Brinecell® process was used to treat a 1 to 400 dilution of spent Clepo 204-T at 50 C and 60 g/L salt. After 8 hours of treatment, the color remaining was 8 units and the solution appeared colorless. Treatment of the Metalx B-9 reduced the color to 60 units. The effect of salt concentration, solution temperature, and solution pH was evaluated on the Brinecell® treatment process.

619 (ES/ER/TM-131) Radiological criteria for remedial actions at radioactively contaminated sites. Environmental Restoration Program. Kocher, D.C. Oak Ridge National Lab., TN (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002304. Source: OSTI; NTIS; GPO Dep.

Radiological criteria for determining acceptable remedial actions at radioactively contaminated sites on the Oak Ridge Reservation are presented in this report. The proposed criteria address protection of human health and man's exposure environment but do not address protection of nonhuman biota. In addition, the criteria do not address potential exposures to nonradioactive hazardous chemicals that might be present at contaminated sites; however, as discussed, the protection principles on which the proposed radiological criteria are based could be used to determine acceptable remedial actions for carcinogenic hazardous chemicals. An important rationale for the proposed remedial action criteria is that many of the contaminated sites of concern were used for deliberate disposals of radioactive waste, principally low-level waste, or the sites contain radioactive materials similar in composition and potential hazard to many low-level wastes. Indeed, the basis for this proposal is the notion that remedial actions at radioactively contaminated sites on the Oak Ridge Reservation should achieve risks to human health consistent with current standards for ongoing, permitted disposals of low-level radioactive waste at Oak Ridge and all other United States Department of Energy (DOE) sites.

620 (ES/ER/TM-136) Environmental Restoration Program waste minimization and pollution prevention self-assessment. Oak Ridge National Lab., TN (United States); Radian Corp., Oak Ridge, TN (United States). Oct

1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003903. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration (ER) Program within Martin Marietta Energy Systems, Inc. is currently developing a more active waste minimization and pollution prevention program. To determine areas of programmatic improvements within the ER Waste Minimization and Pollution Prevention Awareness Program, the ER Program required an evaluation of the program across the Oak Ridge K-25 Site, the Oak Ridge National Laboratory, the Oak Ridge Y-12 Plant, the Paducah Environmental Restoration and Waste Minimization Site, and the Portsmouth Environmental Restoration and Waste Minimization Site. This document presents the status of the overall program as of fourth quarter FY 1994, presents pollution prevention cost avoidance data associated with FY 1994 activities, and identifies areas for improvement. Results of this assessment indicate that the ER Waste Minimization and Pollution Prevention Awareness Program is firmly established and is developing rapidly. Several procedural goals were met in FY 1994 and many of the sites implemented ER waste minimization options. Additional growth is needed, however, for the ER Waste Minimization and Pollution Prevention Awareness Program.

621 (INEL-94/00010) Hydrothermal Oxidation Hazardous Waste Pilot Plant Test Bed. Welland, H.; Reed, W.; Valentich, D.; Charlton, T. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950284-1: 1. international workshop on supercritical water oxidation, Jackson, FL (United States), 6-9 Feb 1995). Order Number DE95008607. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) is fabricating a Hydrothermal Oxidation (HTO) Hazardous Waste Pilot Plant Test Bed to evaluate and test various HTO reactor concepts for initial processing of the U.S. Department of Energy (DOE) mixed wastes. If the HTO process is successful it will significantly reduce the volume of DOE mixed wastes by destroying the organic constituents.

622 (INEL-94/00034) Results after nine years of field testing low-level radioactive waste forms using lysimeters. McConnell, J.W. Jr. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Rogers, R.D.; Jastrow, J.D.; Sanford, W.E.; Sullivan, T.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 13p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941265-1: 16. DOE annual low-level radioactive waste management conference, Baltimore, MD (United States), 12-15 Dec 1994). Source: OSTI; NTIS; INIS.

The Field Lysimeter Investigations: Low-Level Waste Data Base Development Program is obtaining information on the performance of radioactive waste forms. Ion-exchange resins from a nuclear power station were solidified into waste forms using Portland cement and vinyl ester-styrene. These waste forms are being tested to develop a low-level waste data base and to obtain information on survivability of waste forms in a disposal environment. This paper reviews radionuclide releases from those waste forms in the first 9 years of sampling. Included is a discussion of the recently discovered upward migration of radionuclides. Also, lysimeter data are applied to a performance assessment source term model, and initial results are presented.

623 (INEL-94/00045) Risk and cost tradeoffs for remote retrieval of buried waste. Hyde, R.A.; Grienbenow, B.E.; Nickelson, D.F. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941214-2: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95008606. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration is supporting the development, demonstration, testing, and evaluation of a suite of technologies that, when integrated with commercially available technologies, form a comprehensive system for the remediation of radioactive and hazardous buried waste. As a part of the program's technology development, remote retrieval equipment is being developed and tested for the remediation of buried waste. During remedial planning, several factors are considered when choosing remote versus manual retrieval systems. Time that workers are exposed to radioactivity, chemicals, air particulate, and industrial hazards is one consideration. The generation of secondary waste is also a consideration because it amounts to more waste to treat and some wastes may require special handling or treatment. Cost is also a big factor in determining whether remote or manual operations will be used. Other considerations include implementability, effectiveness, and the number of required personnel. This paper investigates each of these areas to show the risk and cost benefits and limitations for remote versus manual retrieval of buried waste.

624 (INEL-94/00051) Development of proposed free release criteria for Idaho National Engineering Laboratory lead. Losinski, S.J. (EG and G Idaho, Inc., Idaho Falls, ID (United States)). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941214-7: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95008617. Source: OSTI; NTIS; INIS; GPO Dep.

The INEL Lead Management Project (LMP) performed an investigation of the origin of lead used as shielding at the INEL and developed radiological profile information that was then used to establish a baseline for the DOE "no-rad-added" standard. Primary findings of the investigation include the following: (a) Much of the lead at the INEL was obtained from a DOE lead bank; (b) Lead inventory at the DOE lead bank was derived primarily from recycled sources and was most likely in the form of pure lead; (c) Secondary lead (lead from recycled sources), available in today's market, is expected to have radiological characteristics similar to those of the DOE lead bank; (d) Highly sensitive radiological testing of 20 samples of lead from secondary sources revealed the lead to be radiologically pristine. Beta-, gamma-, and alpha-emitting radionuclide concentrations were all found to be less than detectable, except for a very small quantity of lead-210 (an alpha emitter), which is a naturally occurring isotope of lead. Based on the pristine nature of lead, a proposed free release criterion for lead was developed based on a statistical null hypothesis approach. The free release criterion compares the natural background count of a clean lead standard with the natural background count of a sample. When the sample background count cannot be distinguished as different from the standard background count at the 95% confidence level, then the sample is considered radiologically clean.

625 (INEL-94/00052) **Case study and presentation of the DOE treatability group concept for low-level and mixed waste streams.** Kirkpatrick, T.D. (Lockheed Idaho Technologies, Germantown, MD (United States)); Heath, B.A.; Davis, K.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1994]. 10p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941214-6: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95008616. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Compliance Act of 1992 requires the US Department of Energy (DOE) to prepare an inventory report of its mixed waste and treatment capacities and technologies. Grouping waste streams according to technological requirements is the logical means of matching waste streams to treatment technologies, and streamlines the effort of identifying technology development needs. To provide consistency, DOE has developed a standard methodology for categorizing waste into treatability groups based on three characteristic parameters: radiological, bulk physical/chemical form, and regulated contaminant. Based on category and component definitions in the methodology, descriptive codes or strings of codes are assigned under each parameter, resulting in a waste characterization amenable to a computerized format for query and sort functions. By using only the applicable parameters, this methodology can be applied to all waste types generated within the DOE complex: radioactive, hazardous, mixed, and sanitary/municipal. Implementation of this methodology will assist the individual sites and DOE Headquarters in analyzing waste management technology and facility needs.

626 (INEL-94/0071) **Development and calibration of an on-line aerosol monitor for PHEBUS test FPT1.** O'Brien, J.E.; Carmack, W.J.; Sprenger, M.H.; Thurston, G.C.; Hunt, J.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). Oct 1994. 28p. Sponsored by US-DOE, Washington, DC (United States); Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95008564. Source: OSTI; NTIS; INIS; GPO Dep.

An on-line aerosol monitor (OLAM2) has been developed and tested for PHEBUS test FPT1. OLAM2 utilizes new detachable fiber optic cables and sapphire light pipes for light transmission between the OLAM and the electronics. This light transmission system was tested and found to provide better signal-to-noise performance than was achieved with the continuous fibers used for test FPT0. An additional advantage of the detachable fiber/light pipe system is ease of installation. Aerosol testing (OLAM calibration) was performed in order to verify adequate signal-to-noise performance of the new fiber optic system over the specified operating conditions and to check the quantitative light attenuation measurements against theoretical predictions. Results of the testing indicated that light extinction measurements obtained during Phebus tests could be used to estimate aerosol volume concentrations, if diamond window fouling can be avoided. OLAM2 was also subjected to a proof pressure test and a long-term thermal stability test. These tests verified the mechanical and thermal integrity of the OLAM within design specifications. Long-term output signal stability was also verified with the system maintained at design temperature and half-design pressure.

627 (INEL-94/0159) **Monitoring plan for routine organic air emissions at the Radioactive Waste Management Complex Waste Storage Facilities.** Galloway, K.J.; Jolley, J.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008569. Source: OSTI; NTIS; INIS; GPO Dep.

This monitoring plan provides the information necessary to perform routine organic air emissions monitoring at the Waste Storage Facilities located at the Transuranic Storage Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory. The Waste Storage Facilities include both the Type I and II Waste Storage Modules. The plan implements a dual method approach where two dissimilar analytical methodologies, Open-Path Fourier Transform Infrared Spectroscopy (OP-FTIR) and ancillary SUMMA® canister sampling, following the US Environmental Protection Agency (EPA) analytical method TO-14, will be used to provide qualitative and quantitative volatile organic concentration data. The Open-Path Fourier Transform Infrared Spectroscopy will provide in situ, real time monitoring of volatile organic compound concentrations in the ambient air of the Waste Storage Facilities. To supplement the OP-FTIR data, air samples will be collected using SUMMA®, passivated, stainless steel canisters, following the EPA Method TO-14. These samples will be analyzed for volatile organic compounds with gas chromatograph/mass spectrometry analysis. The sampling strategy, procedures, and schedules are included in this monitoring plan. The development of this monitoring plan is driven by regulatory compliance to the Resource Conservation and Recovery Act, State of Idaho Toxic Air Pollutant increments, Occupational Safety and Health Administration. The various state and federal regulations address the characterization of the volatile organic compounds and the resultant ambient air emissions that may originate from facilities involved in industrial production and/or waste management activities.

628 (INEL-94/0210) **Large-scale demonstration test plan for digface data acquisition system.** Roybal, L.G.; Svoboda, J.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1994. 40p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008574. Source: OSTI; NTIS; INIS; GPO Dep.

Digface characterization promotes the use of online site characterization and monitoring during waste retrieval efforts, a need that arises from safety and efficiency considerations during the cleanup of a complex waste site. Information concerning conditions at the active digface can be used by operators as a basis for adjusting retrieval activities to reduce safety risks and to promote an efficient transition between retrieval and downstream operations. Most importantly, workers are given advance warning of upcoming dangerous conditions. In addition, detailed knowledge of digface conditions provides a basis for selecting tools and methods that avoid contamination spread and work stoppages. In FY-94, work began in support of a largescale demonstration coordinating the various facets of a prototype digface remediation operation including characterization, contaminant suppression, and cold waste retrieval. This test plan describes the activities that will be performed during the winter of FY-95 that are necessary to assess the performance of the data acquisition and display system in its initial integration with hardware developed in the Cooperative Telerobotic Retrieval (CTR) program. The

six specific objectives of the test are determining system electrical noise, establishing a dynamic background signature of the gantry crane and associated equipment, determining the resolution of the overall system by scanning over known objects, reporting the general functionality of the overall data acquisition system, evaluating the laser topographic functionality, and monitoring the temperature control features of the electronic package.

629 (INEL-94/0223) Evaluation of tubular reactor designs for supercritical water oxidation of U.S. Department of Energy mixed waste. Barnes, C.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008572. Source: OSTI; NTIS; INIS; GPO Dep.

Supercritical water oxidation (SCWO) is an emerging technology for industrial waste treatment and is being developed for treatment of the US Department of Energy (DOE) mixed hazardous and radioactive wastes. In the SCWO process, wastes containing organic material are oxidized in the presence of water at conditions of temperature and pressure above the critical point of water, 374 C and 22.1 MPa. DOE mixed wastes consist of a broad spectrum of liquids, sludges, and solids containing a wide variety of organic components plus inorganic components including radionuclides. This report is a review and evaluation of tubular reactor designs for supercritical water oxidation of US Department of Energy mixed waste. Tubular reactors are evaluated against requirements for treatment of US Department of Energy mixed waste. Requirements that play major roles in the evaluation include achieving acceptable corrosion, deposition, and heat removal rates. A general evaluation is made of tubular reactors and specific reactors are discussed. Based on the evaluations, recommendations are made regarding continued development of supercritical water oxidation reactors for US Department of Energy mixed waste.

630 (INEL-94/0253) Mixed waste integrated program: Logic diagram. Mayberry, J. (Science Applications International Corp., Idaho Falls, ID (United States)); Stelle, S.; O'Brien, M.; Rudin, M.; Ferguson, J.; McFee, J. Idaho National Engineering Lab., Idaho Falls, ID (United States). 30 Nov 1994. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008599. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Integrated Program Logic Diagram was developed to provide technical alternative for mixed wastes projects for the Office of Technology Development's Mixed Waste Integrated Program (MWIP). Technical solutions in the areas of characterization, treatment, and disposal were matched to a select number of US Department of Energy (DOE) treatability groups represented by waste streams found in the Mixed Waste Inventory Report (MWIR).

631 (K/EM-67) 1993 annual report of hazardous waste activities for the Oak Ridge K-25 site. Oak Ridge K-25 Site, TN (United States). Feb 1994. 249p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. Order Number DE94017183. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a detailed listing of all of the Hazardous Waste activities occurring at Martin Marietta's K-25 site. Contained herein are hazardous waste notification forms, waste stream reports, generator fee forms and various TSDR reports.

632 (K/TCD-1111) Technical support for the Soil-tech soil washing project: Interim report. Tomascik, T.S. Oak Ridge K-25 Site, TN (United States). Aug 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94016531. Source: OSTI; NTIS; INIS; GPO Dep.

The organic removal ability of a surfactant solution was studied for an "as-received" soil sample. A 15% surfactant solution was added to an equal portion of the soil sample, by volume, and blended. The mixture was then stirred with a magnetic stirrer. A black precipitate resulted, which was then periodically skimmed off the top of the solution. This was done at both room temperature and at 150°F. The soil sample was examined before and after processing with optical microscopy, environmental scanning electron microscopy (ESEM), energy dispersive x-ray microanalysis (EDS), and analytical chemical analysis (total oil and grease and petroleum hydrocarbons).

633 (LA-12752-MS) An assessment of high-energy explosives and metal contamination in soil at TA-67 (12), L-Site, and TA-14, Q-Site. Haywood, W.; McRae, D.; Powell, J.; Harris, B.W. Los Alamos National Lab., NM (United States). Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005743. Source: OSTI; NTIS; GPO Dep.

The results of the field investigation to determine the kind and concentration of explosives found in the soil and on articles at sites known to be contaminated with energetic materials are given in this report. We are concerned about safety and health hazards associated with some explosives, nitro-organics and organic nitrates. Results from the use of the old and new field spot-test kits to detect the presence of energetic materials are given. Also included are data from the high-performance liquid chromatography (HPLC) analyses of acetonitrile extracts from Q-Site soil samples, and data from the energy-dispersive x-ray fluorescence (EDXRF) analyses for hazardous metals on the same samples.

634 (LA-12753-MS) High explosive spot test analyses of samples from Operable Unit (OU) 1111. McRae, D.; Haywood, W.; Powell, J.; Harris, B. Los Alamos National Lab., NM (United States). Jan 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005742. Source: OSTI; NTIS; GPO Dep.

A preliminary evaluation has been completed of environmental contaminants at selected sites within the Group DX-10 (formerly Group M-7) area. Soil samples taken from specific locations at this detonator facility were analyzed for harmful metals and screened for explosives. A sanitary outflow, a burn pit, a pentaerythritol tetranitrate (PETN) production outflow field, an active firing chamber, an inactive firing chamber, and a leach field were sampled. Energy dispersive x-ray fluorescence (EDXRF) was used to obtain semi-quantitative concentrations of metals in the soil. Two field spot-test kits for explosives were used to assess the presence of energetic materials in the soil and in items found at the areas tested. PETN is the major explosive in detonators manufactured and destroyed at Los Alamos. No measurable amounts of PETN or other explosives were detected in the soil, but items taken from the burn area and a high-energy explosive (HE)/chemical sump were contaminated. The concentrations of lead, mercury, and uranium are given.

635 (LA-12764-ENV) Environmental surveillance at Los Alamos during 1992. Kohen, K. (and others); Stoker, A.; Stone, G. Los Alamos National Lab., NM (United States). Jul 1994. 365p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94016643. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the environmental surveillance program at Los Alamos National Laboratory during 1992. The Laboratory routinely monitors for radiation and for radioactive and nonradioactive materials at (or on) Laboratory sites as well as in the surrounding region. LANL uses the monitoring results to determine compliance with appropriate standards and to identify potentially undesirable trends. Data were collected in 1992 to assess external penetrating radiation; quantities of airborne emissions and liquid effluents; concentrations of chemicals and radionuclides in ambient air, surface waters and groundwaters, municipal water supply, soils and sediments, and foodstuffs; and environmental compliance. Using comparisons with standards, regulations, and background levels, this report concludes that environmental effects from Laboratory operations are small and do not pose a demonstrable threat to the public, laboratory employees, or the environment.

636 (LA-12783-MS) Performance of horizontal versus vertical vapor extraction wells. Birdsell, K.H.; Roseberg, N.D.; Edlund, K.M. Los Alamos National Lab., NM (United States). Jun 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94013643. Source: OSTI; NTIS; INIS; GPO Dep.

Vapor extraction wells used for site remediation of volatile organic chemicals in the vadose zone are typically vertical wells. Over the past few years, there has been an increased interest in horizontal wells for environmental remediation. Despite the interest and potential benefits of horizontal wells, there has been little study of the relative performance of horizontal and vertical vapor extraction wells. This study uses numerical simulations to investigate the relative performance of horizontal versus vertical vapor extraction wells under a variety of conditions. The most significant conclusion that can be drawn from this study is that in a homogeneous medium, a single, horizontal vapor extraction well outperforms a single, vertical vapor extraction well (with surface capping) only for long, linear plumes. Guidelines are presented regarding the use of horizontal wells.

637 (LA-12789-MS) Numerical simulations in support of the in situ bioremediation demonstration at Savannah River. Travis, B.J.; Rosenberg, N.D. Los Alamos National Lab., NM (United States). Jun 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94013199. Source: OSTI; NTIS; INIS; GPO Dep.

This report assesses the performance of the in situ bioremediation technology demonstrated at the Savannah River Integrated Demonstration (SRID) site in 1992-1993. The goal of the technology demonstration was to stimulate naturally occurring methanotrophic bacteria at the SRID site with injection of methane, air and air-phase nutrients (nitrogen and phosphate) such that significant amounts of the chlorinated solvent present in the subsurface would be degraded. Our approach is based on site-specific numerical simulations using the TRAMP computer code. In this report, we discuss the interactions among the physical and biochemical processes involved in in situ bioremediation. We also investigate improvements to technology performance, make

predictions regarding the performance of this technology over long periods of time and at different sites, and compare in situ bioremediation with other remediation technologies.

638 (LA-SUB-94-116) Polymer systems testing: Final report. Los Alamos National Lab., NM (United States); Industrial Compliance Technologies, Inc., Wheat Ridge, CO (United States). 12 Aug 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94019171. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory (LANL) is in the process of decontaminating lead shielding material. The procedure involves abrasive surface etching of the shielding to remove the outer layer of lead that contains the majority of the radioactive contaminants. This procedure generates a small volume of mixed waste in the form of a wet residue containing lead, abrasive grit (Al_2O_3), uranium and water. IC Technologies, Inc. (ICT) has developed several processes for the treatment of mixed wastes involving stabilizing/encapsulating the waste in a polymer monolith. The objective of the test program was to verify the applicability of ICT's technology to this specific waste stream and provide LANL baseline data on the performance of polymer encapsulation techniques. Polymer microencapsulation of lead shielding/blasting grit (surrogate) mixed waste was evaluated. Two polymers, melamine formaldehyde and polyester xylene, were used to examine the effect of waste loading on Toxicity Characteristic Leaching Procedure (TCLP) extract Pb concentration. Six levels of waste loading were evaluated by eleven tests. Significant reduction in Pb solubility during TCLP was achieved. Additional optimization to the single-stage microencapsulation technique utilized will be necessary to mitigate the toxic (RCRA) characteristic of the waste.

639 (LA-SUB-95-4) Multiple encapsulation of LANL waste using polymers. Final report. Schwartz, R.L. Los Alamos National Lab., NM (United States). 12 Aug 1994. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005730. Source: OSTI; NTIS; INIS; GPO Dep.

Polymer encapsulation of lead shielding/blasting grit (surrogate) mixed waste was optimized at bench scale using melamine formaldehyde, polyurethane, and butadiene thermosetting polymers. Three pellet-based intermediate waste forms, and a final waste form, were prepared, each providing an additional level of integrity. Encapsulated waste integrity was measured by chemical and physical techniques. Compliance was established using the Toxicity Characteristic Leaching Procedure. Equipment appropriate to pilot-scale demonstration of program techniques was investigated. A preliminary equipment list and layout, and process block flow diagram were prepared.

640 (LA-UR-94-688) Selected case studies in modeling and simulation applied to environmentally conscious design and manufacturing. Lytle, T.W.; Smith, D.M. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940859-4: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94007556. Source: OSTI; NTIS; GPO Dep.

The Process Modeling System (ProMoS) is an object-oriented, mass balance-based, discrete-event manufacturing simulation framework. Analytical capabilities within ProMoS

include complete mass balance specifications and facility profiles for materials consumption, resource utilization and worker exposure. ProMoS software has been utilized in the design of several processing facilities including a Printed Wiring Board (PWB) Manufacturing plant and Department of Energy (DOE) nuclear material processing plants. ProMoS was employed to optimize facility design with respect to production/storage capacity, transportation/shipping constraints, waste generation, cost, worker safety and overall environmental consequences. In addition, ProMoS has been employed in the operational characterization of processing facilities at Los Alamos National Laboratory. The environments used to develop these assessment tools will be discussed in addition to a review of initial implementation results.

641 (LA-UR-94-718) Cleaning up DOE's weapons sites: Issues of organization and management. Morzinski, J.A. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940876-1: International Ergonomics Association workshop, Toronto (Canada), 15-19 Aug 1994). Order Number DE94009306. Source: OSTI; NTIS; INIS; GPO Dep.

Many Department of Energy facilities across the United States are seriously contaminated with radioactive and other hazardous wastes. Decades of focus on weapons production and inadequate attention to long-term solutions for dealing with those wastes have resulted in tremendous problems. The Department of Energy recognizes the seriousness of those problems and is addressing them. In some cases existing management systems are being used to accomplish the new mission of environmental cleanup, and in other cases new systems have been created to help carry out that mission. Widespread criticism of those efforts to data are evidence that the management systems being used may not be appropriate for the job. In particular, it appears that some management systems aren't producing desired results because they are not well aligned with the people and tasks for whom they are intended, and these issues are discussed in this report.

642 (LA-UR-94-1452) Measurement of the thermal diffusivity and speed of sound of hydrothermal solutions via the laser-induced grating technique. Butenhoff, T.J. Los Alamos National Lab., NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940633-5: 12. symposium on thermophysical properties, Boulder, CO (United States), 19-24 Jun 1994). Order Number DE94014717. Source: OSTI; NTIS; INIS; GPO Dep.

Hydrothermal processing is being developed as a method for organic destruction for the Hanford Site in Washington. Hydrothermal processing refers to the redox reactions of chemical compounds in supercritical or near-supercritical aqueous solutions. In order to design reactors for the hydrothermal treatment of complicated mixtures found in the Hanford wastes, engineers need to know the thermophysical properties of the solutions under hydrothermal conditions. The author used the laser-induced grating technique to measure the thermal diffusivity and speed of sound of hydrothermal solutions. In this non-invasive optical technique, a transient grating is produced in the hydrothermal solution by optical absorption from two crossed time-coincident nanosecond laser pulses. The grating is probed by measuring the diffraction efficiency of a third laser beam. The

grating relaxes via thermal diffusion, and the thermal diffusivity can be determined by measuring the decay of the grating diffraction efficiency as a function of the pump-probe delay time. In addition, intense pump pulses produce counterpropagating acoustic waves that appear as large undulations in the transient grating decay spectrum. The speed of sound in the sample is simply the grating fringe spacing divided by the undulation period. The cell is made from a commercial high pressure fitting and is equipped with two diamond windows for optical access. Results are presented for dilute dye/water solutions with $T = 400$ C and pressures between 20 and 70 MPa.

643 (LA-UR-94-2110) Risk assessment of CST-7 proposed waste treatment and storage facilities Volume I: Limited-scope probabilistic risk assessment (PRA) of proposed CST-7 waste treatment & storage facilities. Volume II: Preliminary hazards analysis of proposed CST-7 waste storage & treatment facilities. Sasser, K. Los Alamos National Lab., NM (United States). Jun 1994. 416p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94014482. Source: OSTI; NTIS; INIS; GPO Dep.

In FY 1993, the Los Alamos National Laboratory Waste Management Group [CST-7 (formerly EM-7)] requested the Probabilistic Risk and Hazards Analysis Group [TSA-11 (formerly N-6)] to conduct a study of the hazards associated with several CST-7 facilities. Among these facilities are the Hazardous Waste Treatment Facility (HWTF), the HWTF Drum Storage Building (DSB), and the Mixed Waste Receiving and Storage Facility (MWRSF), which are proposed for construction beginning in 1996. These facilities are needed to upgrade the Laboratory's storage capability for hazardous and mixed wastes and to provide treatment capabilities for wastes in cases where offsite treatment is not available or desirable. These facilities will assist Los Alamos in complying with federal and state regulations.

644 (LA-UR-94-2808) Two practical incineration-alternative prototype demonstrations for TSCA and RCRA wastes. Coogan, J.J. (Los Alamos National Lab., NM (United States)); Kang, M.; Rosocha, L.A.; Tennant, R.A.; Cage, M.R.; Gill, J.T. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9408153-1: AIChE '94: mixed waste treatment technology development session, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94018290. Source: OSTI; NTIS; INIS; GPO Dep.

Results from two pilot-scale demonstrations will be presented. The first was performed at the DOE's Savannah River Site where a trailer mounted silent discharge plasma (SDP) system was used to destroy hazardous compounds from the off-gas stream of a soil vapor extraction system. In the second, pilot-plant tests of a two-stage, combined packed-bed silent discharge plasma (PBR/SDP) treatment process were performed for PCB surrogates contained in both kerosene and hydraulic fluid.

645 (LA-UR-94-2880) Los Alamos National Laboratory Environmental Restoration Project quarterly technical report, April-June 1994. Los Alamos National Lab., NM (United States). 18 Aug 1994. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94018296. Source: OSTI; NTIS; GPO Dep.

This quarterly report describes the technical status of activities in the Los Alamos National Laboratory Environmental Restoration (ER) Project. Each activity is identified by an activity data sheet number, a brief title describing the activity or the technical area where the activity is located, and the name of the project leader. The Hazardous and Solid Waste Amendments (HSWA) portion of the facility operating permit requires the submission of a technical progress report on a quarterly basis. This report, submitted to fulfill the permit's requirement, summarizes the work performed and the results of sampling and analysis in the ER Project. Suspect waste found include: Radionuclides, high explosives, metals, solvents and organics. The data provided in this report have not been validated. These data are considered "reviewed data."

646 (LA-UR-94-3483) Soil pore-gas sampling by photoacoustic radiometry. Sollid, J.E. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9411144-1: Optical sensing for environmental and process monitoring, McLean, VA (United States), 7-10 Nov 1994). Order Number DE95002717. Source: OSTI; NTIS; INIS; GPO Dep.

Concentrations of volatile organics in a soil pore-gas plume were measured using a commercially available multi-gas monitor. The monitor is a photoacoustic radiometer (PAR) controlled by an on-board, programmable microprocessor. The measurements determine the extent and location of the vapor plume in the subsurface. At least twelve wells surrounding the sources are measured quarterly. The sources are located in former liquid chemical waste disposal pits and shafts at Los Alamos National Laboratory. The primary constituents of the plume are 1,1,1 trichloroethane (TCA), trichloroethene (TCE), and tetrachloroethene or perchloroethene or perchloroethene (PCE). Four quarters of data are presented for TCA. All were used primarily as solvents and degreasers. Previously the composition of the vapor plume was determined by Gas Chromatography Mass Spectrometer GCMS methods. Photoacoustic radiometry and gas chromatography are discussed giving the advantages and disadvantages of each method, although in this program they are basically complementary. Gas chromatography is a more qualitative method to determine which analytes are present and the approximate concentration. Photoacoustic radiometry, to function well, requires foreknowledge of constituents and serves best to determine how much is present. Measurements are quicker and more direct with photoacoustic methods. Once the constituents to be measured are known, the cost to monitor is much less using photoacoustics, and the results are available more quickly.

647 (LA-UR-94-4316) Real-Time Monitoring of Alpha Emissions. Final report, FY 1994. Gritz, R.; Fowler, M.; Wouters, J. Los Alamos National Lab., NM (United States). [1994]. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005254. Source: OSTI; NTIS; INIS; GPO Dep.

A technology is being developed for on-line, real-time monitoring of mixed and low-level incinerator stacks for levels of airborne alpha activity. The Large-Volume Flow Thru Detector System uses a detector composed of multiple parallel plates of scintillating material fabricated so that the entire stack gas stream flows directly through the inter-plate volume. This report is largely a compilation of 3 reports on background reduction, once-through flow tests, and the

aeronautical/mechanical engineering work. The full text of each report is included as an appendix.

648 (LA-UR-95-90) Characterization of low level mixed waste at Los Alamos National Laboratory. Hepworth, E. (Santa Fe Engineering, Ltd. (United States)); Montoya, A.; Holizer, B. Los Alamos National Lab., NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9503102-2: Waste management symposia, Tucson, AZ (United States), 1 Mar 1995). Order Number DE95006334. Source: OSTI; NTIS; INIS; GPO Dep.

The characterization program was conducted to maintain regulatory compliance and support ongoing waste treatment and disposal activities. The characterization team conducted a characterization review of wastes stored at the Laboratory that contain both a low-level radioactive and a hazardous component. The team addressed only those wastes generated before January 1993. The wastes reviewed, referred to as legacy wastes, had been generated before the implementation of comprehensive waste acceptance documentation procedures. The review was performed to verify existing RCRA code assignments and was required as part of the Federal Facility Compliance Agreement (FFCA). The review entailed identifying all legacy LLMW items in storage, collecting existing documentation, contacting and interviewing generators, and reviewing code assignments based upon information from knowledge of process (KOP) as allowed by RCRA. The team identified 7,546 legacy waste items in the current inventory, and determined that 4,200 required further RCRA characterization and documentation. KOP characterization was successful for accurately assigning RCRA codes for all but 117 of the 4,200 items within the scope of work. As a result of KOP interviews, 714 waste items were determined to be non-hazardous, while 276 were determined to be non-radioactive. Other wastes were stored as suspect radioactive. Many of the suspect radioactive wastes were certified by the generators as non-radioactive and will eventually be removed.

649 (LA-UR-95-322) Development and status of the AL Mixed Waste Treatment Plan or I love that mobile unit of mine. Bounini, L. (USDOE Grand Junction Project Office, CO (United States)); Williams, M.; Zygmunt, S. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-42: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006280. Source: OSTI; NTIS; INIS; GPO Dep.

Nine Department of Energy (DOE) sites reporting to the Albuquerque Office (AL) have mixed waste that is chemically hazardous and radioactive. The hazardous waste regulations require the chemical portion of mixed waste to be treated to certain standards. The total volume of low-level mixed waste at the nine sites is equivalent to 7,000 drums, with individual site volumes ranging from 1 gallon of waste at the Pinellas Plant to 4,500 drums at Los Alamos National Laboratory. Nearly all the sites have a diversity of wastes requiring a diversity of treatment processes. Treatment capacity does not exist for much of this waste, and it would be expensive for each site to build the diversity of treatment processes needed to treat its own wastes. DOE-AL assembled a team that developed the AL Mixed Waste Treatment Plan that uses the resources of the nine sites to treat the waste at the sites. Work on the plan started in October 1993, and the plan was finalized in March 1994. The plan uses

commercial treatment, treatability studies, and mobile treatment units. The plan specifies treatment technologies that will be built as mobile treatment units to be moved from site to site. Mobile units include bench-top units for very small volumes and treatability studies, drum-size units that treat one drum per day, and skid-size units that handle multiple drum volumes. After the tools needed to treat the wastes were determined, the sites were assigned to provide part of the treatment capacity using their own resources and expertise. The sites are making progress on treatability studies, commercial treatment, and mobile treatment design and fabrication. To date, this is the only plan for treating waste that brings the resources of several DOE sites together to treat mixed waste. It is the only program actively planning to use mobile treatment coordinated between DOE sites.

650 (LA-UR-95-346) A portable system for the treatment of water-reactive mixed waste. Dziewinski, J. (Los Alamos National Lab., NM (United States)); Munger, D. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-57: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006273. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the wastes generated by the DOE complex are both hazardous and radioactive. Mixed wastes must be treated to remove the hazardous waste component before they are disposed as radioactive waste. This paper discusses the development of a treatment process for mixed wastes that exhibit the reactive hazardous characteristic. Specifically, these wastes react readily and violently with water. Wastes such as lithium hydride (LiH), sodium metal, and potassium metal are the primary wastes in this category. Besides their tendency to react with water, the wastes also produce alkaline hydroxides and hydrogen gas as products of the reactions. If in aqueous form and if the pH exceeds 12.5, the alkaline hydroxides must be further processed to lower the pH to the range of 2-12.5 to remove the corrosive hazardous characteristic. The hydrogen gas formed during treatment is not considered a RCRA hazardous waste, but the hydrogen poses a substantial safety hazard because it can form explosive mixtures with air. Tritium may also be substituted for hydrogen in the LiH. If tritium is present, special processing may be necessary to avoid exhausting tritium into the environment. Because of the requirement to control environmental exposure to radioactivity contained in the wastes, the process design requires a reaction within enclosed vessels. These vessels require inert gas purging with subsequent off-gas scrubbing and high-efficiency particulate air (HEPA) filtration before discharge to the atmosphere. The process described involves directly immersing the water-reactive waste in a volume of water, controlling the reaction rate by the rate of addition of the waste to the reactor. The possibility of explosion is avoided by excluding oxygen.

651 (LA-UR-95-1164) Final report on the oxidation of energetic materials in supercritical water. Final Air Force report. Buelow, S.J. (and others); Allen, D.; Anderson, G.K. Los Alamos National Lab., NM (United States). 3 Apr 1995. 222p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95010888. Source: OSTI; NTIS; GPO Dep.

The objective of this project was to determine the suitability of oxidation in supercritical fluids (SCO), particularly water (SCWO), for disposal of propellants, explosives, and

pyrotechnics (PEPs). The SCO studies of PEPs addressed the following issues: The efficiency of destruction of the substrate. The products of destruction contained in the effluents. Whether the process can be conducted safely on a large scale. Whether energy recovery from the process is economically practicable. The information essential for process development and equipment design was also investigated, including issues such as practical throughput of explosives through a SCWO reactor, reactor materials and corrosion, and models for process design and optimization.

652 (LBL-PUB-5353-Rev.1) Low-level waste certification plan for the Lawrence Berkeley Laboratory Hazardous Waste Handling Facility. Revision 1. Lawrence Berkeley Lab., CA (United States). 10 Jan 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95008501. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this plan is to describe the organization and methodology for the certification of low-level radioactive waste (LLW) handled in the Hazardous Waste Handling Facility (HWHF) at Lawrence Berkeley Laboratory (LBL). This plan is composed to meet the requirements found in the Westinghouse Hanford Company (WHC) Solid Waste Acceptance Criteria (WAC) and follows the suggested outline provided by WHC in the letter of April 26, 1990, to Dr. R.H. Thomas, Occupational Health Division, LBL. LLW is to be transferred to the WHC Hanford Site Central Waste Complex and Burial Grounds in Hanford, Washington.

653 (LBL-PUB-5354-Rev.1) Mixed waste certification plan for the Lawrence Berkeley Laboratory Hazardous Waste Handling Facility. Revision 1. Lawrence Berkeley Lab., CA (United States). Jan 1995. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95008502. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this plan is to describe the organization and methodology for the certification of mixed waste handled in the Hazardous Waste Handling Facility (HWHF) at Lawrence Berkeley Laboratory (LBL). This plan is composed to meet the requirements found in the Westinghouse Hanford Company (WHC) Solid Waste Acceptance Criteria (WAC) and follows the suggested outline provided by WHC in the letter of April 26, 1990, to Dr. R.H. Thomas, Occupational Health Division, LBL. Mixed waste is to be transferred to the WHC Hanford Site Central Waste Complex and Burial Grounds in Hanford, Washington.

654 (ORNL-6769) Proceedings of Soil Decon '93: Technology targeting radionuclides and heavy metals. Oak Ridge National Lab., TN (United States). Sep 1993. 661p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-9306198-: Soil Decon '93: technology targeting radionuclides and heavy metals, Gatlinburg, TN (United States), 16-17 Jun 1993). Order Number DE94006204. Source: OSTI; NTIS; INIS; GPO Dep.

The principal objective for convening this workshop was to exchange ideas and discuss with scientists and engineers methods for removing radionuclides and/or toxic metals from soils. Over the years there have been numerous symposia, conferences, and workshops directed at soil remediation. However, this may be the first where the scope was narrowed to the removal of radionuclides and toxic metals from soils. The intent was to focus on the separation processes controlling the removal of the radionuclide and/or metal from

soil. Its purpose was not intended to be a soil washing/leaching workshop, but rather to identify a variety or combination of processes (chemical, physical, and biological) that can be used in concert with the applicable engineering approaches to decontaminate soils of radionuclides and toxic metals. Abstracts and visual aids used by the speakers of the workshop are presented in this document.

655 (ORNL-6826) Waste Management and Remedial Action Division programs and facilities report. Corrill, L.S. (ed.). Oak Ridge National Lab., TN (United States). Dec 1994. 211p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010051. Source: OSTI; NTIS; INIS; GPO Dep.

Routine waste management operations of the Energy Systems Waste Management Organization (ESWMO) at Oak Ridge National Laboratory (ORNL) are the direct responsibility of the Waste Management and Remedial Action Division (WMRAD). This document provides a comprehensive description of WMRAD's site activities, describes how programs are conducted, and identifies those facilities used to manage waste as of July 1994. The ORNL waste management mission is reduction, collection, treatment, storage, and disposal of U.S. Department of Energy (DOE) wastes, generated primarily in pursuit of ORNL missions, in order to protect human health and safety and the environment. In carrying out this mission, waste management staff in the WMRAD will (1) guide ORNL in optimizing waste reduction and waste management capabilities and in minimizing generation and (2) conduct waste management operations in a compliant, publicly acceptable, technically sound, environmentally correct, timely, and cost-efficient manner. Waste management requirements for DOE radioactive wastes are detailed in DOE Order 5820.2A, and the ORNL Waste Management Program encompasses all elements of this order. The requirements of this DOE order and other appropriate DOE orders, along with applicable Tennessee Department of Environment and Conservation and U.S. Environmental Protection Agency rules and regulations and local environmental, safety, and health requirements, provide the principal source of regulatory guidance for waste management operations at ORNL.

656 (ORNL/ER-57) Level trend analysis summary report for Oak Ridge National Laboratory inactive liquid low-level waste tanks. Oak Ridge National Lab., TN (United States). Environmental Restoration Div.; Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Sep 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER/Sub-87-99053/43). Order Number DE95003262. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory facilities have produced liquid low-level waste (LLLW) that is radioactive and/or hazardous. Storage tanks have been used to collect and store these wastes. Most of the collection system, including the tanks, is located below the ground surface. Many of the systems have been removed from service (i.e., are not inactive) but contain residual amounts of waste liquid and sludges. A plan of action has been developed by DOE to ensure that environmental impacts from the waste remaining in the inactive tanks system are minimized. The Federal Facility Agreement (FFA) does not require any type of testing or

monitoring for the inactive LLLW tanks that are removed from service but does require waste characterization of tanks contents, risk characterization of tanks removed from service, and remediation of the inactive tanks and their contents. This report is form information only and is not required by the FFA. It includes a description of the methodology and results of level trend analyses for the Category D tanks listed in the FFA that currently belong to the Environmental Restoration Program.

657 (ORNL/ER-218) Technical management plan for sample generation, analysis, and data review for Phase 2 of the Clinch River Environmental Restoration Program. Brandt, C.C. (Oak Ridge National Lab., TN (United States)); Benson, S.B.; Beeler, D.A. Oak Ridge National Lab., TN (United States). Mar 1994. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94014029. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4226.

The Clinch River Remedial Investigation (CRRRI) is designed to address the transport, fate, and distribution of waterborne contaminants (radionuclides, metals, and organic compounds) released from the US Department of Energy's (DOE's) Oak Ridge Reservation (ORR) and to assess potential risks to human health and the environment associated with these contaminants. The remedial investigation is entering Phase 2, which has the following items as its objectives: define the nature and extent of the contamination in areas downstream from the DOE ORR, evaluate the human health and ecological risks posed by these contaminants, and perform preliminary identification and evaluation of potential remediation alternatives. This plan describes the requirements, responsibilities, and roles of personnel during sampling, analysis, and data review for the Clinch River Environmental Restoration Program (CR-ERP). The purpose of the plan is to formalize the process for obtaining analytical services, tracking sampling and analysis documentation, and assessing the overall quality of the CR-ERP data collection program to ensure that it will provide the necessary building blocks for the program decision-making process.

658 (ORNL/ER-234) Data and records management plan for the White Wing Scrap Yard (Waste Area Grouping 11) geophysical survey at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Apr 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94018406. Source: OSTI; NTIS; INIS; GPO Dep.

A geophysical survey is being conducted across the Waste Area Grouping (WAG) 11 site to locate buried non-indigenous materials. The survey team will collect data manually in field logbooks and on field forms using two types of instrumentation. This Data and Records Management Plan will describe the process necessary to record and track the geophysical data in a manner that will comply with the data quality objectives (DQOs) described in the WAG 11 Geophysical Survey Work Plan and with Environmental Restoration (ER) regulations concerning project records. This plan provides guidance on handling documentation within CDM Federal Programs Corporation (CDM Federal) and by the survey team in the field. An initial (Phase 1) survey will be performed in established areas (referred to as known target areas) using both 10-ft and 20-ft grid spacing.

The results of the Phase 1 survey will be evaluated to determine the appropriate grid spacing to be used for the subsequent survey phase. The second phase (Phase 2) will then cover the remainder of the WAG 11 area using the grid spacing determined in Phase 1. The objective of the Phase 2 survey will be to estimate the horizontal and vertical extent of nonindigenous materials in the subsurface that are man-made, ferrous, highly resistive, and/or possess conductivity above background, based on the survey grid established in Phase 1.

659 (ORNL/ER-275) Surveillance and maintenance plan for the inactive liquid low-level waste tanks at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States). Nov 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003972. Source: OSTI; NTIS; INIS; GPO Dep.

ORNL has a total of 54 inactive liquid low-level waste (ILLW) tanks. In the past, these tanks were used to contain radioactive liquid wastes from various research programs, decontamination operations, and reactor operations. The tanks have since been removed from service for various reasons; the majority were retired because of their age, some due to integrity compromises, and others because they did not meet the current standards set by the Federal Facilities Agreement (FFA). Many of the tanks contain residual radioactive liquids and/or sludges. Plans are to remediate all tanks; however, until remediation of each tank, this Surveillance and Maintenance (S&M) Plan will be used to monitor the safety and inventory containment of these tanks.

660 (ORNL/ER/Sub-87-99053/28) Selection of liquid-level monitoring method for the Oak Ridge National Laboratory inactive liquid low-level waste tanks, remedial investigation/feasibility study. Oak Ridge National Lab., TN (United States); Bechtel Environmental, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Nov 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Subcontract 12B-99053C. Order Number DE95004736. Source: OSTI; NTIS; INIS; GPO Dep.

Several of the inactive liquid low-level waste (LLLW) tanks at Oak Ridge National Laboratory contain residual wastes in liquid or solid (sludge) form or both. A plan of action has been developed to ensure that potential environmental impacts from the waste remaining in the inactive LLLW tank systems are minimized. This document describes the evaluation and selection of a methodology for monitoring the level of the liquid in inactive LLLW tanks. Criteria are established for comparison of existing level monitoring and leak testing methods; a preferred method is selected and a decision methodology for monitoring the level of the liquid in the tanks is presented for implementation. The methodology selected can be used to continuously monitor the tanks pending disposition of the wastes for treatment and disposal. Tanks that are empty, are scheduled to be emptied in the near future, or have liquid contents that are very low risk to the environment were not considered to be candidates for installing level monitoring. Tanks requiring new monitoring equipment were provided with conductivity probes; tanks with existing level monitoring instrumentation were not modified. The resulting data will be analyzed to determine inactive LLLW tank liquid level trends as a function of time.

661 (ORNL/ER/Sub-92-SK263/1-Rev.2) Leak testing plan for the Oak Ridge National Laboratory liquid low-level waste systems (active tanks): Revision 2. Volume 1: Regulatory background and plan approach; Volume 2: Methods, protocols, and schedules; Volume 3: Evaluation of the ORNL/LT-823DP differential pressure leak detection method; Appendix to Revision 2: DOE/EPA/TDEC correspondence. Douglas, D.G. (Vista Research, Inc., Mountain View, CA (United States)); Wise, R.F.; Starr, J.W.; Maresca, J.W. Jr. Oak Ridge National Lab., TN (United States); Vista Research, Inc., Mountain View, CA (United States). Nov 1994. 222p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008650. Source: OSTI; NTIS; INIS; GPO Dep.

This document, the Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System (Active Tanks), comprises three volumes. The first two volumes address the component-based leak testing plan for the liquid low-level waste system at Oak Ridge, while the third volume describes the performance evaluation of the leak detection method that will be used to test this system. Volume 1, describes that portion of the liquid low-level waste system at that will be tested; it provides the regulatory background, especially in terms of the requirements stipulated in the Federal Facilities Agreement, upon which the leak testing plan is based. Volume 1 also describes the foundation of the plan, portions of which were abstracted from existing federal documents that regulate the petroleum and hazardous chemicals industries. Finally, Volume 1 gives an overview of the plan, describing the methods that will be used to test the four classes of components in the liquid low-level waste system. Volume 2 takes the general information on component classes and leak detection methods presented in Volume 1 and shows how it applies particularly to each of the individual components. A complete test plan for each of the components is presented, with emphasis placed on the methods designated for testing tanks. The protocol for testing tank systems is described, and general leak testing schedules are presented. Volume 3 describes the results of a performance evaluation completed for the leak testing method that will be used to test the small tanks at the facility (those less than 3,000 gal in capacity). Some of the details described in Volumes 1 and 2 are expected to change as additional information is obtained, as the viability of candidate release detection methods is proven in the Oak Ridge environment, and as the testing program evolves.

662 (ORNL/M-2751/V1/Pt.B) Oak Ridge National Laboratory Technology Logic Diagram: Volume 1, Technology Evaluation: Part B, Remedial Action. Oak Ridge K-25 Site, TN (United States). Sep 1993. 222p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93016145. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory Technology Logic Diagram (TLD) was developed to provide a decision-support tool that relates environmental restoration (ER) and waste management (WM) problems at Oak Ridge National Laboratory (ORNL) to potential technologies that can remediate these problems. The TLD identifies the research, development, demonstration, testing, and evaluation needed to develop these technologies to a state that allows technology transfer and application to decontamination and decommissioning (D&D), remedial action (RA), and WM activities. The TLD consists of three fundamentally separate volumes: Vol.

1 (Technology Evaluation), Vol. 2 (Technology Logic Diagram), and Vol. 3 (Technology Evaluation Data Sheets). Part A of Vols. 1 and 2 focuses on D&D. Part B of Vols. 1 and 2 focuses on RA of contaminated facilities. Part C of Vols. 1 and 2 focuses on WM. Each part of Vol. 1 contains an overview of the TLD, an explanation of the program-specific responsibilities, a review of identified technologies, and the ranking of remedial technologies. Volume 2 (Pts. A, B, and C) contains the logic linkages among EM goals, environmental problems, and the various technologies that have the potential to solve these problems. Volume 3 (Pts. A, B, and C) contains the TLD data sheets. The focus of Vol. 1, Pt. B, is RA, and it has been divided into six chapters. The first chapter is an introduction, which defines problems specific to the ER Program for ORNL. Chapter 2 provides a general overview of the TLD. Chapters 3 through 5 are organized into necessary subelement categories: RA, characterization, and robotics and automation. The final chapter contains regulatory compliance information concerning RA.

663 (ORNL/M-2751/V3/Pt.A) Oak Ridge National Laboratory Technology Logic Diagram: Volume 3, Technology evaluation data sheets: Part A, Characterization, Decontamination. Oak Ridge K-25 Site, TN (United States). Sep 1993. 370p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93016167. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory Technology Logic Diagram (TLD) was developed to provide a decision support tool that relates environmental restoration (ER) and waste management (WM) problems at Oak Ridge National Laboratory (ORNL) to potential technologies that can remediate these problems. The TLD consists of three fundamentally separate volumes: Vol. 1, Technology Evaluation; Vol. 2, Technology Logic Diagram; and Vol. 3, Technology Evaluation Data Sheets. Part A of Vols. 1 and 2 focuses on RA. Part B of Vols. 1 and 2 focuses on the D&D of contaminated facilities. Part C of Vols. 1 and 2 focuses on WM. Each part of Vol. 1 contains an overview of the TLD, an explanation of the problems facing the volume-specific program, a review of identified technologies, and rankings of technologies applicable to the site. Volume 2 (Pts. A, B, and C) contains the logic linkages among EM goals, environmental problems, and the various technologies that have the potential to solve these problems. Volume 3 (Pts. A, B, and C) contains the TLD data sheets. This volume provides the technology evaluation data sheets (TEDS) for ER/WM activities (D&D, RA, and WM) that are referenced by a TEDS code number in Vol. 2 of the TLD. Each of these sheets represents a single logic trace across the TLD. These sheets contain more detail than is given for the technologies in Vol. 2. The data sheets are arranged alphanumerically by the TEDS code number in the upper right corner of each sheet.

664 (ORNL/M-2751/V3/Pt.B) Oak Ridge National Laboratory Technology Logic Diagram: Volume 3, Technology evaluation data sheets: Part B, Dismantlement, Remedial action. Oak Ridge K-25 Site, TN (United States). Sep 1993. 493p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93016168. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory Technology Logic Diagram (TLD) was developed to provide a decision support tool that relates environmental restoration (ER) and waste management (WM) problems at Oak Ridge National Laboratory (ORNL) to potential technologies that can remediate

these problems. The TLD identifies the research, development, demonstration testing, and evaluation needed to develop these technologies to a state that allows technology transfer and application to decontamination and decommissioning (D&D), remedial action (RA), and WM activities. The TLD consists of three fundamentally separate volumes: Vol. 1, Technology Evaluation; Vol. 2, Technology Logic Diagram and Vol. 3, Technology Evaluation Data Sheets. Part A of Vols. 1 and 2 focuses on RA. Part B of Vols. 1 and 2 focuses on the D&D of contaminated facilities. Part C of Vols. 1 and 2 focuses on WM. Each part of Vol. 1 contains an overview of the TM, an explanation of the problems facing the volume-specific program, a review of identified technologies, and rankings of technologies applicable to the site. Volume 2 (Pts. A, B, and C) contains the logic linkages among EM goals, environmental problems, and the various technologies that have the potential to solve these problems. Volume 3 (Pts. A, B, and C) contains the TLD data sheets. This volume provides the technology evaluation data sheets (TEDS) for ER/WM activities (D&D, RA and WM) that are referenced by a TEDS code number in Vol. 2 of the TLD. Each of these sheets represents a single logic trace across the TLD. These sheets contain more detail than is given for the technologies in Vol. 2.

665 (ORNL/M-2751/V3/Pt.C) Oak Ridge National Laboratory Technology Logic Diagram: Volume 3, Technology evaluation data sheets: Part C, Robotics/automation, Waste management. Oak Ridge K-25 Site, TN (United States). Sep 1993. 333p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93016169. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory Technology Logic Diagram (TLD) was developed to provide a decision support tool that relates environmental restoration (ER) and waste management (WM) problems at Oak Ridge National Laboratory (ORNL) to potential technologies that can remediate these problems. The TLD identifies the research, development, demonstration testing, and evaluation needed to develop these technologies to a state that allows technology transfer and application to decontamination and decommissioning (D&D), remedial action (RA), and WM activities. The TLD consists of three fundamentally separate volumes: Vol. 1, Technology Evaluation; Vol. 2, Technology Logic Diagram and Vol. 3, Technology Evaluation Data Sheets. Part A of Vols. 1 and 2 focuses on RA. Part B of Vols. 1 and 2 focuses on the D&D of contaminated facilities. Part C of Vols. 1 and 2 focuses on WM. Each part of Vol. 1 contains an overview of the TM, an explanation of the problems facing the volume-specific program, a review of identified technologies, and rankings of technologies applicable to the site. Volume 2 (Pts. A, B, and C) contains the logic linkages among EM goals, environmental problems, and the various technologies that have the potential to solve these problems. Volume 3 (Pts. A, B, and C) contains the TLD data sheets. This volume provides the technology evaluation data sheets (TEDS) for ER/WM activities (D&D, RA and WM) that are referenced by a TEDS code number in Vol. 2 of the TLD. Each of these sheets represents a single logic trace across the TLD. These sheets contain more detail than is given for the technologies in Vol. 2.

666 (ORNL/TM-11250) Preliminary analysis of the ORNL Liquid Low-Level Waste system. Abraham, T.J.; DePaoli, S.M.; Robinson, S.M.; Walker, A.B. Oak Ridge National Lab., TN (United States). Aug 1994. 56p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94017422. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this report is to summarize the status of the Liquid Low-Level Waste (LLLW) Systems Analysis project. The focus of this project has been to collect and tabulate data concerning the LLLW system, analyze the current LLLW system operation, and develop the information necessary for the development of long-term treatment options for the LLLW generated at ORNL. The data used in this report were collected through a survey of Oak Ridge National Laboratory (ORNL) literature, various letter reports, and a survey of all current LLLW generators. These data are also being compiled in a user friendly database for ORNL-wide distribution. The database will allow the quick retrieval of all information collected on the ORNL LLLW system and will greatly benefit any LLLW analysis effort. This report summarizes the results for the analyses performed to date on the LLLW system.

667 (ORNL/TM-11642) Summary report on the Y-12 Sludge Detoxification Demonstration project. Jolley, R.L.; Hollenbeck, P.E.; Kennerly, J.M.; Singh, S.P.N. Oak Ridge National Lab., TN (United States). Jul 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94017647. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 Sludge Detoxification Demonstration was conducted in late 1988 at the Oak Ridge Gaseous Diffusion Plant (subsequently renamed the K-25 Site). The erstwhile Waste Management Technology Center (WMTc) managed the conduct of this waste treatment technology to assist the US Department of Energy/Oak Ridge Operations (DOE/ORO) in implementing the DOE Model. This demonstration was the first project selected by the Hazardous Waste Remedial Actions Program (HAZWRAP) (and funded by DOE) in which a private-sector vendor was contracted to demonstrate an innovative treatment process for treating some of the Oak Ridge Site's radioactive mixed wastes to enable their environmentally compliant disposal. Chem-Nuclear Systems, Inc. (CNSI) was the private-sector vendor selected to demonstrate its X*TRAX™ process. Briefly, the X*TRAX™ process consisted of thermally treating the sludge in an inert atmosphere (to remove the volatile components) to yield a dry residue (containing the nonvolatilized sludge components) and condensed liquids. The dry residue can then be immobilized in cementitious matrix for delisting and disposal in an industrial landfill; the condensed liquids can be disposed in, for example, an incinerator.

668 (ORNL/TM-12250) Methodology to remediate a mixed waste site. Berry, J.B. Oak Ridge National Lab., TN (United States). Aug 1994. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004221. Source: OSTI; NTIS; INIS; GPO Dep.

In response to the need for a comprehensive and consistent approach to the complex issue of mixed waste management, a generalized methodology for remediation of a mixed waste site has been developed. The methodology is based on requirements set forth in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA) and incorporates "lessons learned" from process design, remediation methodologies, and remediation projects. The methodology is applied to the treatment of 32,000 drums of mixed waste sludge at the Oak Ridge K-25

Site. Process technology options are developed and evaluated, first with regard to meeting system requirements and then with regard to CERCLA performance criteria. The following process technology options are investigated: (1) no action, (2) separation of hazardous and radioactive species, (3) dewatering, (4) drying, and (5) solidification/stabilization. The first two options were eliminated from detailed consideration because they did not meet the system requirements. A quantitative evaluation clearly showed that, based on system constraints and project objectives, either dewatering or drying the mixed waste sludge was superior to the solidification/stabilization process option. The ultimate choice between the drying and the dewatering options will be made on the basis of a technical evaluation of the relative merits of proposals submitted by potential subcontractors.

669 (ORNL/TM-12765) Molten salt oxidation of mixed waste: Preliminary bench-scale experiments without radioactivity. Haas, P.A.; Rudolph, J.C.; Bell, J.T. Oak Ridge National Lab., TN (United States). Jun 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94017531. Source: OSTI; NTIS; INIS; GPO Dep.

Molten salt oxidation (MSO) is a process in which organic wastes are oxidized by sparging them with air through a bed of molten sodium carbonate (bp 851 °C) at $\geq 900^\circ\text{C}$. This process is readily applicable to the mixed waste because acidic products from Cl, S, P, etc., in the waste, along with most metals and most radionuclides, are retained within the melt as oxides or salts. Rockwell International has studied the application of MSO to various wastes, including some mixed waste. A unit used by Rockwell to study the mixed waste treatment is presently in use at Oak Ridge National Laboratory (ORNL). ORNL's studies to date have concentrated on chemical flowsheet questions. Concerns that were studied included carbon monoxide (CO) emissions, NO_x emissions, and metal retention under a variety of conditions. Initial experiments show that CO emissions increase with increasing NaCl content in the melt, increasing temperature, and increasing airflow. Carbon monoxide content is especially high (> 2000 ppm) with high chlorine content ($> 10\%$). Thermal NO_x emissions are relatively low (< 5 ppm) at temperatures $< 1000^\circ\text{C}$. However, most (85–100%) of the nitrogen in the feed as organic nitrate or amine was released as NO_x. The metal contents of the melt and of knockout pot samples of condensed salt show high volatilities of Cs as CsCl. Average condensed salt concentrations were 60% for barium and 100% for strontium and cobalt. The cerium disappeared – perhaps from deposition on the alumina reactor walls.

670 (ORNL/TM-12768) Concentration of Melton Valley Storage Tank surrogates with a wiped film evaporator. Boring, M.D.; Farr, L.L.; Fowler, V.L.; Hewitt, J.D. Oak Ridge National Lab., TN (United States). Aug 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001000. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes experiments to determine whether a wiped film evaporator (WFE) might be used to concentrate low-level liquid radioactive waste (LLLW). Solutions used in these studies were surrogates that contain no radionuclides. The compositions of the surrogates were based on one of Oak Ridge National Laboratory's (ORNL's) Melton Valley Storage Tanks (MVSTs). It was found that a WFE could be used to concentrate LLLW to varying degrees by manipulating various parameters. The parameters studied were rotor

speed, process fluid feed temperature and feed rate, and evaporator temperature. Product consistency varied from an unsaturated liquid to a dry powder. Volume reductions up to 68% were achieved. System decontamination factors were consistently in the range of 10^4 .

671 (ORNL/TM-12786) Laboratory development of methods for centralized treatment of liquid low-level waste at Oak Ridge National Laboratory. Arnold, W.D.; Bostick, D.T.; Burgess, M.W.; Taylor, P.A.; Perona, J.J.; Kent, T.E. Oak Ridge National Lab., TN (United States). Oct 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002441. Source: OSTI; NTIS; INIS; GPO Dep.

Improved centralized treatment methods are needed in the management of liquid low-level waste (LLLW) at Oak Ridge National Laboratory (ORNL). LLLW, which usually contains radioactive contaminants at concentrations up to millicurie-per-liter levels, has accumulated in underground storage tanks for over 10 years and has reached a volume of over 350,000 gal. These wastes have been collected since 1984 and are a complex mixture of wastes from past nuclear energy research activities. The waste is a highly alkaline 4-5 M NaNO_3 solution with smaller amounts of other salts. This type of waste will continue to be generated as a consequence of future ORNL research programs. Future LLLW (referred to as newly generated LLLW or NGLLLW) is expected to a highly alkaline solution of sodium carbonate and sodium hydroxide with a smaller concentration of sodium nitrate. New treatment facilities are needed to improve the manner in which these wastes are managed. These facilities must be capable of separating and reducing the volume of radioactive contaminants to small stable waste forms. Treated liquids must meet criteria for either discharge to the environment or solidification for onsite disposal. Laboratory testing was performed using simulated waste solutions prepared using the available characterization information as a basis. Testing was conducted to evaluate various methods for selective removal of the major contaminants. The major contaminants requiring removal from Melton Valley Storage Tank liquids are ^{90}Sr and ^{137}Cs . Principal contaminants in NGLLLW are ^{90}Sr , ^{137}Cs , and ^{106}Ru . Strontium removal testing began with literature studies and scoping tests with several ion-exchange materials and sorbents.

672 (ORNL/TM-12828) Operating cost guidelines for benchmarking DOE thermal treatment systems for low-level mixed waste. Salmon, R.; Loghry, S.L.; Hermes, W.H. Oak Ridge National Lab., TN (United States). Nov 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004734. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents guidelines for estimating operating costs for use in benchmarking US Department of Energy (DOE) low-level mixed waste thermal treatment systems. The guidelines are based on operating cost experience at the DOE Toxic Substances Control Act (TSCA) mixed waste incinerator at the K-25 Site at Oak Ridge. In presenting these guidelines, it should be made clear at the outset that it is not the intention of this report to present operating cost estimates for new technologies, but only guidelines for estimating such costs.

673 (ORNL/TM-12848) Physicochemical and mineralogical characterization of transuranic contaminated soils for uranium soil integrated demonstration. Elless, M.P. (Oak Ridge Inst. for Science and Education, TN (United

States)); Lee, S.Y. Oak Ridge National Lab., TN (United States). Oct 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95007124. Source: OSTI; NTIS; INIS; GPO Dep. Environmental Sciences Division Publication Number 4344.

DOE has initiated the Uranium Soils Integrated Demonstration (USID) project. The objective of the USID project is to develop a remediation strategy that can be adopted for use at other DOE sites requiring remediation. Four major task groups within the USID project were formed, namely the Characterization Task Group (CTG), the Treatability Task Group (TTG), the Secondary Waste Treatment and Disposal Task Group (SWTDTG), and the Risk and Performance Assessment Task Group (RPATG). The CTG is responsible for determining the nature of the uranium contamination in both untreated and treated soil. The TTG is responsible for the selective removal of uranium from these soils in such a manner that the leaching does not seriously degrade the soil's physicochemical characteristics or generate a secondary waste form that is difficult to manage and/or dispose. The SWTDTG is responsible for developing strategies for the removal of uranium from all wastewaters generated by the TTGs. Finally the RPATG is responsible for developing the human health and environmental risk assessment of the untreated and treated soils. Because of the enormity of the work required to successfully remediate uranium-contaminated soils, an integrated approach was designed to avoid needless repetition of activities among the various participants in the USID project. Researchers from Oak Ridge National Laboratory (ORNL), Los Alamos National Laboratory (LANL), Argonne National Laboratory (ANL), and Idaho National Engineering Laboratory (INEL) were assigned characterization and/or treatability duties in their areas of specialization. All task groups are involved in the integrated approach; however, the thrust of this report concentrates on the utility of the integrated approach among the various members of the CTG. This report illustrates the use of the integrated approach for the overall CTG and to provide the results generated specifically by the CTG or ORNL from FY1993 to the present.

674 (ORNL/TM-12876) Jet mixing long horizontal storage tanks. Perona, J.J.; Hylton, T.D.; Youngblood, E.L.; Cummins, R.L. Oak Ridge National Lab., TN (United States). Dec 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006797. Source: OSTI; NTIS; INIS; GPO Dep.

Large storage tanks may require mixing to achieve homogeneity of contents for several reasons: prior to sampling for mass balance purposes, for blending in reagents, for suspending settled solids for removal, or for use as a feed tank to a process. At ORNL, mixed waste evaporator concentrates are stored in 50,000-gal tanks, about 12 ft in diameter and 60 ft long. This tank configuration has the advantage of permitting transport by truck and therefore fabrication in the shop rather than in the field. Jet mixing experiments were carried out on two model tanks: a 230-gal (1/6-linear-scale) Plexiglas tank and a 25,000-gal tank (about 2/3 linear scale). Mixing times were measured using sodium chloride tracer and several conductivity probes distributed through the tanks. Several jet sizes and configurations were tested. One-directional and two-directional jets were tested in both tanks. Mixing times for each tank were correlated with the jet Reynolds number. Mixing times were correlated for the two tank sizes using the recirculation time for the developed jet. When the recirculation times were calculated using the

distance from the nozzle to the end of the tank as the length of the developed jet, the correlation was only marginally successful. Data for the two tank sizes were correlated empirically using a modified effective jet length expressed as a function of the Reynolds number raised to the 1/3 power. Mixing experiments were simulated using the TEMTEST computer program. The simulations predicted trends correctly and were within the scatter of the experimental data with the lower jet Reynolds numbers. Agreement was not as good at high Reynolds numbers except for single nozzles in the 25,000-gal tank, where agreement was excellent over the entire range.

675 (ORNL/TM-12899) Monte Carlo tests of the ELIPGRID-PC algorithm. Davidson, J.R. Oak Ridge National Lab., TN (United States). Apr 1995. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010811. Source: OSTI; NTIS; INIS; GPO Dep.

The standard tool for calculating the probability of detecting pockets of contamination called hot spots has been the ELIPGRID computer code of Singer and Wickman. The ELIPGRID-PC program has recently made this algorithm available for an IBM® PC. However, no known independent validation of the ELIPGRID algorithm exists. This document describes a Monte Carlo simulation-based validation of a modified version of the ELIPGRID-PC code. The modified ELIPGRID-PC code is shown to match Monte Carlo-calculated hot-spot detection probabilities to within $\pm 0.5\%$ for 319 out of 320 test cases. The one exception, a very thin elliptical hot spot located within a rectangular sampling grid, differed from the Monte Carlo-calculated probability by about 1%. These results provide confidence in the ability of the modified ELIPGRID-PC code to accurately predict hot-spot detection probabilities within an acceptable range of error.

676 (ORNL/TM-12908) Analysis of source term modeling for low-level radioactive waste performance assessments. Icenhour, A.S. Oak Ridge National Lab., TN (United States). Mar 1995. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009657. Source: OSTI; NTIS; INIS; GPO Dep.

Site-specific radiological performance assessments are required for the disposal of low-level radioactive waste (LLW) at both commercial and US Department of Energy facilities. This work explores source term modeling of LLW disposal facilities by using two state-of-the-art computer codes, SOURCE1 and SOURCE2. An overview of the performance assessment methodology is presented, and the basic processes modeled in the SOURCE1 and SOURCE2 codes are described. Comparisons are made between the two advective models for a variety of radionuclides, transport parameters, and waste-disposal technologies. These comparisons show that, in general, the zero-order model predicts undecayed cumulative fractions leached that are slightly greater than or equal to those of the first-order model. For long-lived radionuclides, results from the two models eventually reach the same value. By contrast, for short-lived radionuclides, the zero-order model predicts a slightly higher undecayed cumulative fraction leached than does the first-order model. A new methodology, based on sensitivity and uncertainty analyses, is developed for predicting intruder scenarios. This method is demonstrated for ^{137}Cs in a tumulus-type disposal facility. The sensitivity and uncertainty analyses incorporate input-parameter uncertainty into the evaluation of a potential time of intrusion and

the remaining radionuclide inventory. Finally, conclusions from this study are presented, and recommendations for continuing work are made.

677 Sensors for monitoring waste glass quality. Bickford, D.F. To Dept. of Energy. 1992. Filed date 25 Aug 1992. U.S. Patent Application 7-934,394. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94016108. Source: OSTI; NTIS; GPO Dep.

A set of three electrical probes for monitoring alkali and oxygen activity of a glass melt. On-line, real time measurements of the potential difference among the probes when they are placed in electrical contact with the melt yield the activity information and can be used to adjust the composition of the melt in order to produce higher quality glass. The first two probes each has a reference gas and a reference electrolyte and a pair of wires in electrical connection with each other in the reference gas but having one of the wires extending further into the reference electrolyte. The reference gases both include a known concentration of oxygen. The third electrode has a pair of wires extending through an otherwise solid body to join electrically just past the body but having one of the wires extend past this junction. Measuring the potential difference between wires of the first and second probes provides the alkali activity; measurement of the potential difference between wires of the second and third probes provides the oxygen activity of the melt.

678 (PNL-8955) Special waste-form lysimeters - arid: 1984-1992 data summary and preliminary interpretation. Jones, T.L. (New Mexico State Univ., Las Cruces, NM (United States)); Serne, R.J. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000839. Source: OSTI; NTIS; INIS; GPO Dep.

A lysimeter facility constructed at the Hanford Site in south-central Washington State has been used since 1984 to monitor the leaching of buried waste forms under natural conditions. The facility is generating data that are useful in evaluating source-term models used in radioactive waste transport analyses. The facility includes ten bare-soil lysimeters (183 cm diameter by 305 cm depth) containing buried waste forms generated at nuclear reactors in the United States and solidified with Portland M cement, masonry cement, bitumen, and vinyl-ester styrene. The waste forms contained in the lysimeters have been leached under natural, semiarid conditions. In spite of the semiarid conditions, from 1984 through 1992, an average of 45 cm of water leached through the lysimeters, representing 27% of area precipitation. Leachate samples have been routinely collected and analyzed for radionuclide and chemical content. To date, tritium, cobalt-60, and cesium-137 have been identified in the lysimeter leachate samples. From 1984 through 1992, over 4000 μCi of tritium, representing 76 and 71 % of inventory (not decay corrected), have been leached from the two waste forms containing tritium. Cobalt-60 has been found in the leachate from all six of the waste forms that originally contained $> 1 \text{ mCi}$ of inventory. The leached amounts of cobalt-60 represent $< 0.1 \%$ of original cobalt inventories. Mobile cobalt is believed to be chelated with organic compounds, such as ethylenediaminetetraacetic acid (EDTA), that are present in the waste. Trace amounts of cesium-137 have occasionally been identified in leachate from two waste forms since 1991. Qualitatively, the field leaching results confirm laboratory studies suggesting that

tritium is readily leached from cement, and that cobalt-60 is generally leached more easily from cement than from vinyl-ester styrene.

679 (PNL-9744) DOE mixed waste treatment capacity analysis. Ross, W.A.; Wehrman, R.R.; Young, J.R.; Shaver, S.R. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94015162. Source: OSTI; NTIS; INIS; GPO Dep.

This initial DOE-wide analysis compares the reported national capacity for treatment of mixed wastes with the calculated need for treatment capacity based on both a full treatment of mixed low-level and transuranic wastes to the Land Disposal Restrictions and on treatment of transuranic wastes to the WIPP waste acceptance criteria. The status of treatment capacity is reported based on a fifty-element matrix of radiation-handling requirements and functional treatment technology categories. The report defines the classifications for the assessment, describes the models used for the calculations, provides results from the analysis, and includes appendices of the waste treatment facilities data and the waste stream data used in the analysis.

680 (PNL-9746) Pilot-scale production of grout with simulated double-shell slurry feed: Final report. Whyatt, G.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94019084. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the pilot-scale production of grout with simulated double-shell slurry feed (DSSF) waste performed in November 1988, and the subsequent thermal behavior of the grout as it cured in a large, insulated vessel. The report was issued in draft form in April 1989 and comments were subsequently received; however, the report was not finalized until 1994. In finalizing this report, references or information gained after the report was drafted in April 1989 have not been incorporated to preserve the report's historical perspective. This report makes use of criteria from Ridelle (1987) to establish formulation criteria. This document has since been superseded by a document prepared by Reibling and Fadeef (1991). However, the reference to Riddelle (1987) and any analysis based on its content have been maintained within this report. In addition, grout is no longer being considered as the waste form for disposal of Hanford's low-level waste. However, grout disposal is being maintained as an option in case there is an emergency need to provide additional tank space. Current plans are to vitrify low-level wastes into a glass matrix.

681 (PNL-10098) Protocol for VOC-Arid ID remediation performance characterization. Tegner, B.J. (ed.); Hassig, N.L.; Last, G.V. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000825. Source: OSTI; NTIS; INIS; GPO Dep.

The Volatile Organic Compound-Arid Integrated Demonstration (VOC-Arid ID) is a technology development program sponsored by the US Department of Energy's Office of Technology Development that is targeted to acquire, develop, demonstrate, and deploy new technologies for the remediation of VOC contaminants in the soils and groundwaters of arid DOE sites. Technologies cannot be adequately evaluated unless sufficient site characterization and technology performance data have been collection and

analyzed. The responsibility for identifying these data needs has been placed largely on the Principal Investigators (PIs) developing the remediation technology, who usually are not experts in site characterization or in identification of appropriate sampling, analysis, and monitoring techniques to support the field testing. This document provides a protocol for planning the collection of data before, during, and after a test of a new technology. This generic protocol provides the PIs and project managers with a set of steps to follow. The protocol is based on a data collection planning process called the Data Quality Objectives (DQO) process, which was originally developed by the US Environmental Protection Agency and has been expanded by DOE to support site cleanup decisions. The DQO process focuses on the quality and quantity of data required to make decision. Stakeholders to the decisions must negotiate such key inputs to the process as the decision rules that will be used and the acceptable probabilities of making decision errors.

682 (PNL-10146) Dual shell pressure balanced reactor vessel: Final project report. Robertus, R.J.; Fassbender, A.G. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002845. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Office of Energy Research (OER) has previously provided support for the development of several chemical processes, including supercritical water oxidation, liquefaction, and aqueous hazardous waste destruction, where chemical and phase transformations are conducted at high pressure and temperature. These and many other commercial processes require a pressure vessel capable of operating in a corrosive environment where safety and economy are important requirements. Pacific Northwest Laboratory (PNL) engineers have recently developed and patented (U.S. patent 5,167,930 December 1, 1992) a concept for a novel Dual Shell Pressure Balanced Vessel (DSPBV) which could solve a number of these problems. The technology could be immediately useful in continuing commercialization of an R&D 100 award-winning technology, Sludge-to-oil Reactor System (STORS), originally developed through funding by OER. Innotek Corporation is a small business that would be one logical end-user of the DSPBV reactor technology. Innotek is working with several major U.S. engineering firms to evaluate the potential of this technology in the disposal of wastes from sewage treatment plants. PNL entered into a CRADA with Innotek to build a bench-scale demonstration reactor and test the system to advance the economic feasibility of a variety of high pressure chemical processes. Hydrothermal processing of corrosive substances on a large scale can now be made significantly safer and more economical through use of the DSPBV. Hydrothermal chemical reactions such as wet-air oxidation and supercritical water oxidation occur in a highly corrosive environment inside a pressure vessel. Average corrosion rates from 23 to 80 miles per year have been reported by Rice (1994) and Latanision (1993).

683 (PNL-10147) Characterization and monitoring of 300 Area Facility liquid waste streams: Status report. Manke, K.L. (ed.); Riley, R.G.; Ballinger, M.Y.; Damberg, E.G.; Evans, J.C.; Ikenberry, A.S.; Olsen, K.B.; Ozanich, R.M.; Thompson, C.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001484. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of characterizing and monitoring the following sources during a portion of this year: liquid waste streams from Buildings 331, 320, and 3720; treated and untreated Columbia River water; and water at the confluence of the waste streams (that is, end-of-pipe). Characterization and monitoring data were evaluated for samples collected between March 22 and June 21, 1994, and subsequently analyzed for hazardous chemicals, radioactivity, and general parameters. Except for bis(2-ethylhexyl)phthalate, concentrations of chemicals detected and parameters measured at end-of-pipe were below the US Environmental Protection Agency existing and proposed drinking water standards. The source of the chemicals, except bis(2-ethylhexyl)phthalate, is not currently known. The bis(2-ethylhexyl)phthalate is probably an artifact of the plastic tubing used in the early stages of the sampling program. This practice was stopped. Concentrations and clearance times for contaminants at end-of-pipe depended strongly on source concentration at the facility release point, waste stream flow rates, dispersion, and the mechanical action of sumps. When present, the action of sumps had the greatest impact on contaminant clearance times. In the absence of sump activity, dispersion and flow rate were the controlling factors.

684 (PNL-10168) Measurement and estimated health risks of volatile organic compounds and polychlorinated biphenyls in air at the Hanford Site. Patton, G.W.; Cooper, A.T.; Blanton, M.L. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002320. Source: OSTI; NTIS; INIS; GPO Dep.

A variety of radioactive and nonradioactive chemicals have been released in effluent streams and discharged to waste disposal facilities during the nuclear materials production period at the Hanford Site. Extensive environmental surveillance for radioactive materials has occurred at Hanford; however, only limited information is available on the types and concentrations of organic pollutants potentially present. This report describes work performed to provide the Hanford Site Surface Environmental Surveillance Project with representative air concentration data for volatile organic compounds and polychlorinated biphenyls (PCBs). US Environmental Protection Agency (USEPA) volatile organic compound sampling methods evaluated for Hanford Site use were carbon-based adsorbent traps (TO-2) and Summa air canisters (TO-14). Polychlorinated biphenyls were sampled using USEPA method (TO-4), which uses glass fiber filters and polyurethane foam adsorbent beds to collect the PCBs. This report also presents results for environmental surveillance samples collected for volatile organic compound and PCB analyses from 1990 to 1993. All measured air concentrations of volatile organic compounds and PCBs were well below applicable maximum allowable concentration standards for air contaminants. Because of the lack of ambient air concentration standards, a conservative estimate is provided of the potential human health impacts from exposure to the ambient air concentrations measured on the Hanford Site.

685 (PNL-10476) Dual shell reactor vessel: A pressure-balanced system for high pressure and temperature reactions. Robertus, R.J.; Fassbender, A.G.; Deverman, G.S. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 36p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008625. Source: OSTI; NTIS; GPO Dep.

The main purpose of this work was to demonstrate the Dual Shell Pressure Balanced Vessel (DSPBV) as a safe and economical reactor for the hydrothermal water oxidation of hazardous wastes. Experimental tests proved that the pressure balancing piston and the leak detection concept designed for this project will work. The DSPBV was sized to process 10 gal/hr of hazardous waste at up to 399°C (750°F) and 5000 psia (34.5 MPa) with a residence time of 10 min. The first prototype reactor is a certified ASME pressure vessel. It was purchased by Innotech Corporation (licensee) and shipped to Pacific Northwest Laboratory for testing. Supporting equipment and instrumentation were, to a large extent, transported here from Battelle Columbus Division. A special air feed system and liquid pump were purchased to complete the package. The entire integrated demonstration system was assembled at PNL. During the activities conducted for this report, the leak detector design was tested on bench top equipment. Response to low levels of water in oil was considered adequate to ensure safety of the pressure vessel. Shakedown tests with water only were completed to prove the system could operate at 350°C at pressures up to 3300 psia. Two demonstration tests with industrial waste streams were conducted, which showed that the DSPBV could be used for hydrothermal oxidation. In the first test with a metal plating waste, chemical oxygen demand, total organic carbon, and cyanide concentrations were reduced over 90%. In the second test with a munitions waste, the organics were reduced over 90% using H₂O₂ as the oxidant.

686 (PNL-SA-23055) Application of Macro Material Flow Modeling to regional solid waste planning. Holter, G.M.; Stapp, D.C.; Shaver, S.R. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940632-22: Annual meeting and exhibition of the Air and Waste Management Association, Cincinnati, OH (United States), 19-24 Jun 1994). Order Number DE94014995. Source: OSTI; NTIS; GPO Dep.

A prototype Macro Material Flow Model (MMFM) is being developed at PNL to analyze various solid waste management options. This model is a macro-level simulation of the entering that system, also through the associated materials production and use system. Within the model, the various major sectors of the economy are modeled separately, taking into account the interconnections among the sectors, and the sectors are further subdivided into the different functions that results in the generation of solid wastes. The model is expected to be useful in evaluating longer-term, broader-ranging impact than are traditionally evaluated by decision-makers involved in implementing solutions to local or regional solid waste management problems. The MMFM provides a predictive capability that can be used as the basis for evaluating potential impacts from various operating scenarios for a solid waste system on a regional level. Inclusion of materials production and use within the modeling context allows a systems approach to be used, providing a much more thorough understanding of the origins of the solid waste materials and also of possible options for materials recovery and reuse than if a more traditional "end-of-pipe" view of solid waste is adopted. It also allows the interaction of the various waste management alternatives to be more clearly understood, to ensure that suitable flexibility is incorporated as recommended into the resulting overall system.

687 (PNL-SA-23411) A DOE manual: DOE methods for evaluating environmental and waste management samples. Goheen, S.C.; Fadeff, S.K.; Sklarew, D.S.; McCulloch, M.; Mong, G.M.; Riley, R.G.; Thomas, B.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-79: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017476. Source: OSTI; NTIS; INIS; GPO Dep.

DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods) is a guidance/methods document supporting environmental restoration (ER) and waste management (WM) (collectively referred to as EM) sampling and analysis activities at US Department of Energy (DOE) sites. DOE Methods is intended to supplement existing guidance documents (e.g., the US Environmental Protection Agency's Test Methods for Evaluating Solid Waste, SW-846), which apply to low-level or non-radioactive samples, and the complexities of waste and environmental samples encountered at DOE sites. The document contains quality assurance (QA), quality control (QC), safety, sampling, organic analysis, inorganic analysis, and radio-analytical guidance as well as sampling and analytical methods. It is updated every six months (April and October) with additional methods. As of April 1994, DOE methods contained 3 sampling and 39 analytical methods. It is anticipated that between 10 and 20 new methods will be added in October 1994. All methods are either peer reviewed and contain performance data, or are included as draft methods.

688 (PNL-SA-23466) Radiochemistry methods in DOE methods for evaluating environmental and waste management samples. Fadeff, S.K.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-87: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017795. Source: OSTI; NTIS; INIS; GPO Dep.

Current standard sources of radiochemistry methods are often inappropriate for use in evaluating US Department of Energy environmental and waste management (DOE/EW) samples. Examples of current sources include EPA, ASTM, Standard Methods for the Examination of Water and Wastewater and HASL-300. Applicability of these methods is limited to specific matrices (usually water), radiation levels (usually environmental levels), and analytes (limited number). Radiochemistry methods in DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods) attempt to fill the applicability gap that exists between standard methods and those needed for DOE/EM activities. The Radiochemistry chapter in DOE Methods includes an "analysis and reporting" guidance section as well as radiochemistry methods. A basis for identifying the DOE/EM radiochemistry needs is discussed. Within this needs framework, the applicability of standard methods and targeted new methods is identified. Sources of new methods (consolidated methods from DOE laboratories and submissions from individuals) and the methods review process will be discussed. The processes involved in generating consolidated methods add editing individually submitted methods will be compared. DOE Methods is a living document and continues to expand by adding various kinds of methods. Radiochemistry methods are highlighted in this paper. DOE

Methods is intended to be a resource for methods applicable to DOE/EM problems. Although it is intended to support DOE, the guidance and methods are not necessarily exclusive to DOE. The document is available at no cost through the Laboratory Management Division of DOE, Office of Technology Development.

689 (PNL-SA-23742) Vitrification development for sludge and ash mixed wastes. Whittington, K.F. (Pacific Northwest Lab., Richland, WA (United States)); Peters, R.D.; Cooper, M.F.; Bonner, D.; Phares, D.; Perez, S. Pacific Northwest Lab., Richland, WA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225-108: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94012244. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary glass development was carried out on four surrogate wastes. The surrogate wastes evaluated were ash and sludge from Oak Ridge National Laboratory, sludge from Rocky Flats, and sludge from Los Alamos National Laboratory. The work involved numerous melting trials followed by visual homogeneity examination and short-duration leach testing on glass specimens. Melter testing on selected compositions was performed with a laboratory-scale joule-heated furnace. With proper formulations and melter operating parameters, these mixed wastes appear to be readily adaptable to available vitrification technology.

690 (PNL-SA-23770) The effect of vitrification technology on waste loading. Hrma, P.R.; Smith, P.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-111: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95007800. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive wastes on the Hanford Site are going to be permanently disposed of by incorporation into a durable glass. These wastes will be separated into low and high-level portions, and then vitrified. The low-level waste (LLW) is water soluble. Its vitrifiable part (other than off-gas) contains approximately 80 wt% Na_2O , the rest being Al_2O_3 , P_2O_5 , K_2O , and minor components. The challenge is to formulate durable LLW glasses with as high Na_2O content as possible by optimizing the additions of SiO_2 , Al_2O_3 , B_2O_3 , CaO , and ZrO_2 . This task will not be simple, considering the non-linear and interactive nature of glass properties as a function of composition. Once developed, the LLW glass, being similar in composition to commercial glasses, is unlikely to cause major processing problems, such as crystallization or molten salt segregation. For example, inexpensive LLW glass can be produced in a high-capacity Joule-heated melter with a cold cap to minimize volatilization. The high-level waste (HLW) consists of water-insoluble sludge (Fe_2O_3 , Al_2O_3 , ZrO_2 , Cr_2O_3 , NiO , and others) and a substantial water-soluble residue (Na_2O). Most of the water-insoluble components are refractory; i.e., their melting points are above the glass melting temperature. With regard to product acceptability, the maximum loading of Hanford HLW in the glass is limited by product durability, not by radiolytic heat generation. However, this maximum may not be achievable because of technological constraints imposed by melter feed rheology, frit properties, and glass melter limits. These restrictions are discussed in this paper. 38 refs.

691 (PNL-SA-23972) Vitrification: Destroying and immobilizing hazardous wastes. Chapman, C.C.; Peters, R.D.; Perez, J.M. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9404126-3: Mixed waste thermal treatment symposium, Denver, CO (United States), 12-14 Apr 1994). Order Number DE94013321. Source: OSTI; NTIS; GPO Dep.

Researchers at the US Department of Energy's Pacific Northwest Laboratory (PNL) have led the development of vitrification a versatile adaptable process that transforms waste solutions, slurries, moist powder and/or dry solids into a chemically durable glass form. The glass form can be safely disposed or used for other purposes, such as construction material if non-radioactive. The feed used in the process can be either combustible or non-combustible. Organic compounds are decomposed in the melters' plenum, while the inorganic residue melts into a molten glass pool. The glass produced by this process is a chemically durable material comparable to natural obsidian. Its properties typically allow it to pass the EPA Toxicity (TCLP) test as non-hazardous. To date, no glass produced by vitrification has failed the TCLP test. Vitrification is thus an ideal method of treating DOE's mixed waste because of its ability to destroy organic compounds and bind toxic or radioactive elements. This article provides an overview of the technology.

692 (PNL-SA-23997) Hanford solid waste management system simulation. Shaver, S.R.; Armacost, L.L.; Konyonenbelt, H.S.; Wehrman, R.R. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941256-2: Winter simulation conference, Orlando, FL (United States), 11-14 Dec 1994). Order Number DE95007155. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes systems analysis and simulation model development for a proposed solid waste management system at a U.S. Department of Energy Site. The proposed system will include a central storage facility, four treatment facilities, and three disposal sites. The material managed by this system will include radioactive, hazardous, and mixed radioactive and hazardous wastes. The objective of the modeling effort is to provide a means of evaluating throughput and capacity requirements for the proposed treatment, storage, and disposal facilities. The model is used to evaluate alternative system configurations and the effect on the alternatives of changing waste stream characteristics and receipt schedules. An iterative modeling and analysis approach is used that provides macro-level models early in the project and establishes credibility with the customer. The results from the analyses based on the macro models influence system design decisions and provide information that helps focus subsequent model development. Modeling and simulation of alternative system configurations and operating strategies yield a better understanding of the solid waste system requirements. The model effectively integrates information obtained through systems analysis and waste characterization to provide a consistent basis for system and facility planning.

693 (PNL-SA-24093) A chemical basis for the partitioning of radionuclides in incinerator operation. Burger, L.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830.

(CONF-9409178-15: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95005403. Source: OSTI; NTIS; INIS; GPO Dep.

For waste containing small amounts of radioactivity, rad waste (RW), or mixed waste (MW) containing both radioactive and chemically hazardous components, incineration is a logical management candidate because of inherent safety, waste volume reduction, and low costs. Successful operation requires that the facility is properly designed and operated to protect workers and to limit releases of hazardous materials. The large decrease in waste volume achieved by incineration also results in a higher concentration of most of the radionuclides and non radioactive heavy metals in the ash products. These concentrations impact subsequent treatment and disposal. The various constituents (chemical elements) are not equal in concentration in the various incinerator feed materials, nor are they equal in their contribution to health risks on subsequent handling, or accidental release. Thus, for management of the wastes it is important to be able to predict how the nuclides partition between the primary combustion residue which may be an ash or a fused slag, the fine particulates or fly ash that is trapped in the burner off-gas by several different techniques, and the airborne fraction that escapes to the atmosphere. The objective of this report is to provide an estimate of how different elements of concern may behave in the chemical environment of the incinerator. The study briefly examines published incinerator operation data, then considers the properties of the elements of concern, and employs thermodynamic calculations, to help predict the fate of these RW and MW constituents. Many types and configurations of incinerators have been designed and tested.

694 (PNL-SA-24289) Barriers to development and deployment of innovative waste minimization technologies. Flores, E.A.; Donaghue, J.F. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940853-13: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE95004932. Source: OSTI; NTIS; INIS; GPO Dep.

Increasing regulation and scrutiny is driving waste generators towards reducing the use of scarce natural resources and reducing or eliminating was streams. There is increasing emphasis on developing and deploying technologies that meet industry needs for recovering valuable materials in a cost-effective manner. At the Department of Energy's (DOE) Hanford Site, Battelle operates Pacific Northwest Laboratory (PNL). PNL's mission is to develop technologies to clean up the environment, and to assist industry in being competitive on a global scale. One such technology developed by PNL is the Waste Acid Detoxification and Reclamation (WADR) process. This technology recovers acids from metal-bearing spent solutions, separating out the metals (which are a valuable byproduct of the acid recycling operation) from the acids. WADR uses selective precipitation and distillation together in an innovative waste recycling technology. Selective precipitation removes the heavy metals, and vacuum distillation recovers clean acid. However, WADR and other innovative waste reduction technologies face numerous barriers to successful development and deployment in the field.

695 (PNL-SA-24418) The Efficient Separations and Processing Integrated Program. Kuhn, W.L.; Gephart, J.M. Pacific Northwest Lab., Richland, WA (United States).

Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-78: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017480. Source: OSTI; NTIS; INIS; GPO Dep.

The Efficient Separations and Processing Integrated Program (ESPIP) was created in 1991 to identify, develop, and perfect separations technologies and processes to treat wastes and address environmental problems throughout the US Department of Energy (DOE) complex. The ESPIP funds several multiyear tasks that address high-priority waste remediation problems involving high-level, low-level, transuranic, hazardous, and mixed (radioactive and hazardous) wastes. The ESPIP supports applied R&D leading to demonstration or use of these separations technologies by other organizations within DOE's Office of Environmental Restoration and Waste Management. Examples of current ESPIP-funded separations technologies are described here.

696 (PNL-SA-24672) **Vitrification of high sulfate wastes.** Merrill, R.A.; Whittington, K.F.; Peters, R.D. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409178-12: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95004560. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) through the Mixed Waste Integrated Program (MWIP) is investigating the application of vitrification technology to mixed wastes within the DOE system. This work involves identifying waste streams, laboratory testing to identify glass formulations and characterize the vitrified product, and demonstration testing with the actual waste in a pilot-scale system. Part of this program is investigating process limits for various waste components, specifically those components that typically create problems for the application of vitrification, such as sulfate, chloride, and phosphate. This work describes results from vitrification testing for a high-sulfate waste, the 183-H Solar Evaporation Basin waste at Hanford. A low melting phosphate glass formulation has been developed for a waste stream high in sodium and sulfate. At melt temperatures in the range of 1,000 C to 1,200 C, sulfate in the waste is decomposed to gaseous oxides and driven off during melting, while the remainder of the oxides stay in the melt. Decomposition of the sulfates eliminates the processing problems typically encountered in vitrification of sulfate-containing wastes, resulting in separation of the sulfate from the remainder of the waste and allowing the sulfate to be collected in the off-gas system and treated as a secondary waste stream. Both the vitreous product and intentionally devitrified samples are durable when compared to reference glasses by TCLP and DI water leach tests. Simple, short tests to evaluate the compatibility of the glasses with potential melter materials found minimal corrosion with most materials.

697 (PNL-SA-24694) **Vitrification and waste glass compositional limits.** Chapman, C.C.; Whittington, K.F.; Peters, R.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940853-6: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94017475. Source: OSTI; NTIS; INIS; GPO Dep.

The most important issue when evaluating the suitability of a waste stream for vitrification is the composition of the waste. Appropriate analytical data are required to ensure that adequate information is available for evaluating and implementing the technology. Although vitrification can be used to immobilize almost any waste stream through dilution of the waste with glass formers, it may be too costly for certain limiting conditions. This report provides guidelines of these limit and the consequent analytical requirements that are necessary for appropriate qualitative cost estimates.

698 (PNL-SA-24698) **Organic destruction to enhance the separation of strontium in radioactive wastes.** Schmidt, A.J.; Elmore, M.R.; Orth, R.J.; Jones, E.O.; Zacher, A.H.; Hart, T.R.; Neuenschwander, G.G.; Poshusta, J.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941016-2: Materials week '94, Rosemont, IL (United States), 3-7 Oct 1994). Order Number DE95004926. Source: OSTI; NTIS; INIS; GPO Dep.

A low-temperature (300 C to 375 C) hydrothermal organic destruction process is being evaluated to help facilitate the removal of complexed radioactive species from bulk liquid components in Hanford tank waste. The work focuses on hydrothermal processing to destroy organic compounds that contribute to waste safety issues and organic complexants that promote the solubility of radioactive constituents such as ^{90}Sr and ^{241}Am . For the studies discussed here, testing was conducted using a nonradioactive Hanford tank waste simulant. The relative destruction rates of a variety of organic compounds known to be present in Hanford tank waste were evaluated. In addition, the tendency for these organic compounds to complex strontium and the effect of hydrothermal treatment on strontium removal were investigated.

699 (PNL-SA-25362) **Use of mass spectrometric methods for field screening of VOC's.** Evans, J.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411180-1-Vugraphs: Air and Waste Management Association annual conference, Eugene, OR (United States), 16-18 Nov 1994). Order Number DE95004903. Source: OSTI; NTIS; INIS; GPO Dep.

Includes viewgraphs.

While mass spectrometric (MS) methods of chemical analysis, particularly gas chromatography-mass spectrometry (GC/MS), have been the mainstay of environmental organic analytical techniques in the laboratory through the use of EPA and other standard methods, field implementation is relatively rare. Instrumentation and methods now exist for utilizing MS and GC/MS techniques in the field for analysis of VOC's in gas phase, aqueous, and soil media. Examples of field investigations utilizing HP 5971A and Viking Spectra-Trak systems for analysis of VOC's in all three media will be presented. Mass spectral methods were found to offer significant advantages in terms of speed of analysis and reliability of compound identification over field gas chromatography (GC) methods while preserving adequate levels of detection sensitivity. The soil method in particular provides a method for rapid in-field analysis of methanol preserved samples thus minimizing the problem of volatiles loss which typically occurs with routine use of the EPA methods and remote analysis. The high cost of MS instrumentation remains a major obstacle to more widespread use.

700 (RFP-4831) Status of the fluidized bed unit. Williams, P.M.; Wade, J.F. EG and G Rocky Flats, Inc., Golden, CO (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-9404126-4: Mixed waste thermal treatment symposium, Denver, CO (United States), 12-14 Apr 1994). Order Number DE94013523. Source: OSTI; NTIS; INIS; GPO Dep.

Rocky Flats has a serious mixed waste problem. No technology or company has a license and available facilities to remedy this dilemma. One solution under study is to use a catalytic fluidized bed unit to destroy the combustible portion of the mixed waste. The fluidized bed thermal treatment program at Rocky Flats is building on knowledge gained over twenty years of successful development activity. The FBU has numerous technical advantages over other thermal technologies to treat Rocky Flats' mixed waste, the largest being the lower temperature (700°C versus 1000°C) which reduces acid corrosion and mechanical failures and obviates the need for ceramic lining. Successful demonstrations have taken place on bench, pilot, and full-scale tests using radioactive mixed wastes. The program is approaching implementation and licensing of a production-scale fluidized bed system for the safe treatment of mixed waste. The measure for success on this project is the ability to work closely with the community to jointly solve problems and respond to concerns of mixed waste treatment at Rocky Flats.

701 (RFP-4903) Microwave vitrification of Rocky Flats hydroxide precipitation sludge, Building 774. Progress report. Eschen, V.G.; Sprenger, G.S. (eds.); Fennner, G.S.; Corbin, I.E. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-950216-128: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95010358. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the first set of experiments performed on transuranic (TRU) precipitation sludge produced in Building 774, to determine the operating parameters for the microwave vitrification process. Toxicity Characteristic Leach Procedure (TCLP) results of the raw sludge showed concentrations of lead, silver and cadmium which were in excess of land disposal restrictions (LDR). Crushed, borosilicate glass was used as a frit source to produce a highly desirable, vitrified, product that required less energy to produce. TCLP testing, of microwaved samples, showed favorable results for 40 and 50% waste loading. The results of this study are encouraging and support the development of microwave vitrification technology for the treatment of various mixed waste streams at Rocky Flats Environmental Technology Site. However, additional experiments are required to fully define the operating parameters for a production-scale system.

702 (RFP-4927) Microwave waste processing technology overview. Sprenger, G.S. (EG and G Rocky Flats, Inc., Golden, CO (United States)); Petersen, R.D. EG and G Rocky Flats, Inc., Golden, CO (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE95010273. Source: OSTI; NTIS; INIS; GPO Dep.

Applications using microwave energy in the chemical processing industry have increased within the last ten years. Recently, interest in waste treatment applications process development, especially solidification, has grown. Microwave

waste processing offers many advantages over conventional waste treatment technologies. These advantages include a high density, leach resistant, robust waste form, volume and toxicity reduction, favorable economics, in-container treatment, good public acceptance, isolated equipment, and instantaneous energy control. The results from the "cold" demonstration scale testing at the Rocky Flats nuclear weapons facility are described. Preliminary results for a transuranic (TRU) precipitation sludge indicate that volume reductions of over 80% are achievable over the current immobilization process. An economic evaluation performed demonstrated cost savings of \$11.68 per pound compared to the immobilization process currently in use on wet sludge.

703 (SAND-94-0495C) Multipurpose storage/transport/disposal packages for DOE nuclear low-level wastes: An emerging need and a regulatory challenge. Keane, M.P. (Dept. of Energy, Washington, DC (United States). Office of Transportation, Emergency Management, and Analytical Services); Lillian, D.; Falci, F.P.; Sorenson, K.B.; Hohnstreiter, G.F. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (IAEA-SR-189-35; CONF-940212-5: Seminar on developments in radioactive waste transport, Vienna (Austria), 21-25 Feb 1994). Order Number DE94018888. Source: OSTI; NTIS; INIS; GPO Dep.

As the United States embarks upon a major effort to cleanup its nuclear defense facilities, a large quantity of low-level waste (LLW) will be generated. This LLW must be managed and ultimately placed into final disposal. Much of this waste is expected to exceed certain limits defined in U.S. regulations (Title 10, U.S. Code of Federal Regulations, part 61) called Class C. The waste which exceeds Class C, called Greater-than-Class-C (GTCC), poses a major challenge to waste managers. Each GTCC waste form must be placed into costly geologic disposal unless separate approval is obtained from the United States regulator to place it into less costly "near-surface" land burial. Management of GTCC will also require, to some extent, storage and transport prior to its final disposal. A further LLW stream exists in the United States also stemming from the prior operations of United States defense facilities, viz., radioactively contaminated and irradiated scrap metal which has been accumulating over the past forty years. Similarly, as cleanup, decontamination, and decommissioning proceeds, this contaminated scrap metal inventory is expected to grow rapidly. This paper explores the notion of the authors that an opportunity for a synergistic solution to two difficult waste management problems may be available in the United States today, and perhaps may similarly be available in other nuclear countries as well. The possibility exists for fabricating packaging from contaminated scrap metal (which would otherwise be part of the waste inventory) and for using these packaging for storage, transport and disposal of GTCC in near-surface burial facilities without reopening or repacking. This approach is appealing and should lead to major safety and cost benefits. An examination of existing regulations with the intent to propose additions, changes, or clarifications that would effectively and beneficially regulate such combined activity is proposed.

704 (SAND-94-0786C) Feasibility of permeation grouting for constructing subsurface barriers. Dwyer, B.P. Sandia National Labs., Albuquerque, NM (United States). Mar 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000.

(CONF-941124-4: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94009062. Source: OSTI; NTIS; INIS; GPO Dep.

The technical feasibility of emplacing a barrier beneath a waste site using directionally drilled boreholes and permeation grouting was investigated. The benefits of this emplacement system are: (1) Directionally drilled boreholes provide access beneath a waste site without disturbing the waste; (2) interim containment of contaminants allows time for the development of remediation options; (3) in the interim, the volume of waste remains fixed; (4) barriers may enhance the effectiveness of in situ remediation actions; and (5) barrier systems may provide permanent waste containment.

705 (SAND-94-1003C) Mixed waste chemical compatibility with packaging components. Nigrey, P.J. (Sandia National Labs., Albuquerque, NM (United States)); Conroy, M.; Blalock, L.B. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940815-6: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94011436. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper, a chemical compatibility testing program for packaging of mixed wastes at will be described. We will discuss the choice of four γ -radiation doses, four time durations, four temperatures and four waste solutions to simulate the hazardous waste components of mixed wastes for testing materials compatibility of polymers. The selected simulant wastes are (1) an aqueous alkaline mixture of sodium nitrate and sodium nitrite; (2) a chlorinated hydrocarbon mixture; (3) a simulant liquid scintillation fluid; and (4) a mixture of ketones. A selection of 10 polymers with anticipated high resistance to one or more of these types of environments are proposed for testing as potential liner or seal materials. These polymers are butadiene acrylonitrile copolymer, cross-linked polyethylene, epichlorohydrin, ethylene-propylene rubber, fluorocarbon, glass-filled tetrafluoroethylene, high-density poly-ethylene, isobutylene-isoprene copolymer, polypropylene, and styrene-butadiene rubber. We will describe the elements of the testing plan along with a metric for establishing time resistance of the packaging materials to radiation and chemicals.

706 (SAND-94-1119C) Containment removal from solid waste by supercritical carbon dioxide. Smith, H.M. (Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div.); Olson, R.B.; Adkins, C.L.J.; Russick, E.M. Sandia National Labs., Albuquerque, NM (United States); Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; AC04-76DP00613. (KCP-613-5423; CONF-940578-1: Pollution prevention conference, Denver, CO (United States), 3-5 May 1994). Order Number DE94011029. Source: OSTI; NTIS; GPO Dep.

Large quantities of solid wastes such as rags, kimpwipes, swabs, coveralls, gloves, etc., contaminated with oils, greases and hazardous solvents are generated by industry and the government. If the hazardous components (offs, greases and solvents) could be segregated from the much larger bulk of non-hazardous material, then these solid materials could potentially be handled as sanitary waste, at a

significant cost savings. AlliedSignal KCP, a typical DOE manufacturing site, spent several hundred thousand dollars in CY92 for disposal of contaminated solid wastes. Similarly, Naval Air Station North Island, San Diego, also spent several hundred thousand dollars in CY91 for disposal of rags. Under the Department of Energy (DOE)/United States Air Force (USAF) Memorandum of Understanding, the objective of this joint AlliedSignal KCP/Sandia National Laboratories project is to demonstrate the feasibility of using supercritical carbon dioxide (SC-CO₂) to segregate hazardous oils, greases, and organic solvents from non-hazardous solid waste such as rags, wipes, swabs, coveralls, gloves, etc. Supercritical carbon dioxide possesses many of the characteristics desired in an "environmentally acceptable" solvent system. It is nontoxic, inexpensive, and recyclable. Carbon dioxide possesses a moderate critical temperature (31°C) and pressure (1071 psi). At 37°C and pressures greater than 2000 psi, the density is greater than 0.8 g/cc. Contaminants dissolved in the supercritical CO₂ solvent are separated out by expansion of the fluid to a subcritical pressure where CO₂ is a gas and the dissolved materials precipitate out (usually as a liquid or solid). The gaseous CO₂ can then be recompressed and recycled.

707 (SAND-94-1444C) The use of supercritical carbon dioxide for contaminant removal from solid waste. Adkins, C.L.J. (Sandia National Labs., Albuquerque, NM (United States)); Russick, E.M.; Smith, H.M.; Olson, R.B. Sandia National Labs., Albuquerque, NM (United States); Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; AC04-76DP00613. (KCP-613-5462; CONF-9406181-2: Joint Army, Navy, NASA, Air Force environmentally benign cleaning and degreasing technical workshop, Indian Head, MD (United States), 14-15 Jun 1994). Order Number DE94013342. Source: OSTI; NTIS; INIS; GPO Dep.

Supercritical carbon dioxide is being explored as a waste minimization technique for separating oils, greases and solvents from solid waste. The contaminants are dissolved into the supercritical fluid and precipitated out upon depressurization. The carbon dioxide solvent can then be recycled for continued use. Definitions of the temperature, pressure, flowrate and potential co-solvents are required to establish the optimum conditions for hazardous contaminant removal. Excellent extractive capability for common manufacturing oils, greases, and solvents has been observed in both supercritical and liquid carbon dioxide. Solubility measurements are being used to better understand the extraction process, and to determine if the minimum solubility required by federal regulations is met.

708 (SAND-94-2409C) Effects of mixed waste simulants on transportation packaging plastic components. Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950646-3: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95006305. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of hazardous and radioactive materials packaging is to, enable these materials to be transported without posing a threat to the health or property of the general public. To achieve this aim, regulations have been written

establishing general design requirements for such packagings. While no regulations have been written specifically for mixed waste packaging, regulations for the constituents of mixed wastes, i.e., hazardous and radioactive substances, have been codified. The design requirements for both hazardous and radioactive materials packaging specify packaging compatibility, i.e., that the materials of the packaging and any contents be chemically compatible with each other. Furthermore, Type A and Type B packaging design requirements stipulate that there be no significant chemical, galvanic, or other reaction between the materials and contents of the package. Based on these requirements, a Chemical Compatibility Testing Program was developed in the Transportation Systems Department at Sandia National Laboratories (SNL). The program, supported by the US Department of Energy's (DOE) Transportation Management Division, EM-261 provides the means to assure any regulatory body that the issue of packaging material compatibility towards hazardous and radioactive materials has been addressed. In this paper, we describe the general elements of the testing program and the experimental results of the screening tests. The implications of the results of this testing are discussed in the general context of packaging development. Additionally, we present the results of the first phase of this experimental program. This phase involved the screening of five candidate liner and six seal materials against four simulant mixed wastes.

709 (SAND-94-2564C) DOE's performance evaluation project for mixed low-level waste disposal. Waters, R.D. (Sandia National Labs., Albuquerque, NM (United States)); Chu, M.S.Y.; Gruebel, M.M.; Lee, D.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-20: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006823. Source: OSTI; NTIS; INIS; GPO Dep.

A performance evaluation (PE) is an analysis that estimates radionuclide concentration limits for 16 potential Department of Energy (DOE) mixed low-level waste (ULLW) disposal sites based on the analysis of two environmental exposure pathways (air and water) to an off-site individual and an inadvertent-intruder exposure pathway. Sites are analyzed for their ability to attenuate concentrations of specific radionuclides that could be released from wastes in a hypothetical ULLW disposal facility. Site-specific data and knowledge are used within a generic framework that is consistent across all sites being evaluated. After estimates of waste concentrations for the three pathways are calculated, the minimum of the waste concentration values is selected as the permissible waste concentration for each radionuclide. The PE results will be used as input to the process for DOE's ULLW disposal configuration. Preliminary comparisons of results from the PE and site-specific performance assessments indicate that the simple PE results generally agree with results of the performance assessments, even when site conditions are complex. This agreement with performance-assessment results increases confidence that similar results can be obtained at other sites that have good characterization data. In addition, the simple analyses contained in the PE illustrate a potential method to satisfy the needs of many regulators and the general public for a simple, conservative, defensible, and easily understandable analysis that provides results similar to those of more complex analyses.

710 (SAND-94-8005) Process waste assessment for the Radiography Laboratory. Phillips, N.M. Sandia National Labs., Livermore, CA (United States). Jul 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94018399. Source: OSTI; NTIS; INIS; GPO Dep.

This Process Waste Assessment was conducted to evaluate the Radiography Laboratory, located in Building 923. It documents the processes, identifies the hazardous chemical waste streams generated by these processes, recommends possible ways to minimize waste, and serves as a reference for future assessments of this facility. The Radiography Laboratory provides film radiography or radioscopy (electronic imaging) of weapon and nonweapon components. The Radiography Laboratory has six x-ray machines and one gamma ray source. It also has several other sealed beta- and gamma-ray isotope sources of low microcurie (μCi) activity. The photochemical processes generate most of the Radiography Laboratory's routinely generated hazardous waste, and most of that is generated by the DuPont film processor. Because the DuPont film processor generates the most photochemical waste, it was selected for an estimated material balance.

711 (SAND-94-8240) Technical resource document for assured thermal processing of wastes. Farrow, R.L.; Fisk, G.A.; Hartwig, C.M.; Hurt, R.H.; Ringland, J.T.; Swansiger, W.A. Sandia National Labs., Albuquerque, NM (United States). Jun 1994. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94015352. Source: OSTI; NTIS; GPO Dep.

This document is a concise compendium of resource material covering assured thermal processing of wastes (ATPW), an area in which Sandia aims to develop a large program. The ATPW program at Sandia is examining a wide variety of waste streams and thermal processes. Waste streams under consideration include municipal, chemical, medical, and mixed wastes. Thermal processes under consideration range from various incineration technologies to non-incineration processes such as supercritical water oxidation or molten metal technologies. Each of the chapters describes the element covered, discusses issues associated with its further development and/or utilization, presents Sandia capabilities that address these issues, and indicates important connections to other ATPW elements. The division of the field into elements was driven by the team's desire to emphasize areas where Sandia's capabilities can lead to major advances and is therefore somewhat unconventional. The report will be valuable to Sandians involved in further ATPW program development.

712 (SAND-95-0172C) Gas cylinder disposal pit remediation waste minimization and management. Alas, C.A. (Sandia National Labs., Albuquerque, NM (United States)); Solow, A.; Criswell, C.W.; Spengler, D.; Brannon, R.; Schwender, J.M.; Eckman, C.K.; Rusthoven, T. Sandia National Labs., Albuquerque, NM (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-80: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006458. Source: OSTI; NTIS; INIS; GPO Dep.

A remediation of a gas cylinder disposal pit at Sandia National Laboratories, New Mexico has recently been completed. The cleanup prevented possible spontaneous releases of hazardous gases from corroded cylinders that

may have affected nearby active test areas at Sandia's Technical Area III. Special waste management, safety, and quality plans were developed and strictly implemented for this project. The project was conceived from a waste management perspective, and waste minimization and management were built into the planning and implementation phases. The site layout was planned to accommodate light and heavy equipment, storage of large quantities of suspect soil, and special areas to stage and treat gases and reactive chemicals removed from the pit, as well as radiation protection areas. Excavation was a tightly controlled activity using experienced gas cylinder and reactive chemical specialists. Hazardous operations were conducted at night under lights, to allow nearby daytime operations to function unhindered. The quality assurance plan provided specific control of, and documentation for, critical decisions, as well as the record of daily operations. Both hand and heavy equipment excavation techniques were utilized. Hand excavation techniques were utilized. Hand excavation techniques allows sealed glass containers to be exhumed unharmed. In the end, several dozen thermal batteries; 5 pounds (2.3 kg) of lithium metal; 6.6 pounds (3.0 kg) of rubidium metal; several kilograms of unknown chemicals; 140 cubic yards (107 cubic meters) of thorium-contaminated soil; 270 cubic yards (205 cubic meters) of chromium-contaminated soil; and 450 gas cylinders, including 97 intact cylinders containing inert, flammable, toxic, corrosive, or oxidizing gases were removed and effectively managed to minimize waste.

713 (SAND-95-0290C) **DOE's planning process for mixed low-level waste disposal.** Case, J.T. (USDOE Idaho Operations Office, Idaho Falls, ID (United States)); Letourneau, M.J.; Chu, M.S.Y. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-60: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007728. Source: OSTI; NTIS; INIS; GPO Dep.

A disposal planning process was established by the Department of Energy (DOE) Mixed Low-Level Waste (MLLW) Disposal Workgroup. The process, jointly developed with the States, includes three steps: site-screening, site-evaluation, and configuration study. As a result of the screening process, 28 sites have been eliminated from further consideration for MLLW disposal and 4 sites have been assigned a lower priority for evaluation. Currently 16 sites are being evaluated by the DOE for their potential strengths and weaknesses as MLLW disposal sites. The results of the evaluation will provide a general idea of the technical capability of the 16 disposal sites; the results can also be used to identify which treated MLLW streams can be disposed on-site and which should be disposed of off-site. The information will then serve as the basis for a disposal configuration study, which includes analysis of both technical as well as non-technical issues, that will lead to the ultimate decision on MLLW disposal site locations.

714 (SAND-95-0584C) **Prediction of single-component NAPL behavior for the TEVES Project using T2VOC.** Webb, S.W.; Phelan, J.M. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116-2: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009594. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed simulations have been performed for the TEVES (Thermal Enhanced Vapor Extraction System) Project using the TOUGH2 code considering air, water, and a single-component NAPL. A critical parameter varied in the simulations is the borehole vacuum which directly affects air flow through the system and indirectly influences soil temperatures and water and NAPL fluid masses. Contaminant migration from the heated zone into the unheated soil can occur if the borehole vacuum, or borehole flow rate, is not sufficient. Under these conditions, evaporation of liquids (water and NAPL) due to the heating can cause flow from the heated zone into the unheated soil. Insufficient air sweep may be indicated by a vapor dominated mass flow rate into the borehole, at least for the present configuration. Sufficient air flow through the heated zone must be provided to contain the contaminants within the heated zone.

715 (SAND-95-8007) **Pollution prevention opportunity assessment for the SNL/California waste management facilities.** Braye, S. (Sandia National Labs., Livermore, CA (United States). Environmental Protection Dept.); Phillips, N.M. Sandia National Labs., Livermore, CA (United States). Jan 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95006200. Source: OSTI; NTIS; INIS; GPO Dep.

SNL/California's waste management facilities, Bldgs. 961 and 962-2, generate a secondary stream of hazardous and radioactive waste. This waste stream is generated mainly during the processing and handling of hazardous, radioactive, and mixed wastes (primary waste stream), which are generated by the laboratories, and when cleaning up spills. The secondary waste stream begins with the removal of a generator's hazardous, radioactive, and mixed waste from specified collection areas. The waste stream ends when the containers of processed waste are loaded for shipment off-site. The total amount of secondary hazardous waste generated in the waste management facilities from January 1993 to July 1994 was 1,160.6 kg. The total amount of secondary radioactive waste generated during the same period was 1,528.8 kg (with an activity of 0.070 mCi). Mixed waste usually is not generated in the secondary waste stream. This pollution prevention opportunity assessment (PPOA) was conducted using the graded approach methodology developed by the Department of Energy (DOE) PPOA task group. The original method was modified to accommodate the needs of Sandia's site-specific processes. The options generated for potential hazardous waste minimization, cost savings, and environmental health and safety were the result of a waste minimization team effort. The results of the team efforts are summarized.

716 (UCRL-ID-115754) **Mixed Waste Treatment Project: Computer simulations of integrated flowsheets.** Dietsche, L.J. Lawrence Livermore National Lab., CA (United States). Dec 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94012587. Source: OSTI; NTIS; INIS; GPO Dep.

The disposal of mixed waste, that is waste containing both hazardous and radioactive components, is a challenging waste management problem of particular concern to DOE sites throughout the United States. Traditional technologies used for the destruction of hazardous wastes need to be re-evaluated for their ability to handle mixed wastes, and in some cases new technologies need to be developed. The Mixed Waste Treatment Project (MWTP) was set up by

DOE's Waste Operations Program (EM30) to provide guidance on mixed waste treatment options. One of MWTP's charters is to develop flowsheets for prototype integrated mixed waste treatment facilities which can serve as models for sites developing their own treatment strategies. Evaluation of these flowsheets is being facilitated through the use of computer modelling. The objective of the flowsheet simulations is to provide mass and energy balances, product compositions, and equipment sizing (leading to cost) information. The modelled flowsheets need to be easily modified to examine how alternative technologies and varying feed streams effect the overall integrated process. One such commercially available simulation program is ASPEN PLUS. This report contains details of the Aspen Plus program.

717 (UCRL-ID-118122) ASPEN computer simulations of the mixed waste treatment project baseline flowsheet. Dietsche, L.J.; Upadhye, R.S.; Camp, D.W.; Pendergrass, J.A.; Borduin, L.C.; Thompson, T.K. Lawrence Livermore National Lab., CA (United States). 5 Jul 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006442. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

The treatment and disposal of mixed waste (i.e., waste containing both hazardous and radioactive components) is a challenging waste-management problem of particular concern to Department of Energy (DOE) sites throughout the United States. Traditional technologies used for destroying hazardous wastes must be re-evaluated for their ability to handle mixed wastes, and, in some cases, new technologies must be developed. The Mixed Waste Treatment Project (MWTP), a collaborative effort between Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory, and Pacific Northwest Laboratory (PNL), was established by the DOE's Waste Operations Program (EM-30) to develop and analyze alternative mixed waste treatment approaches. One of the MWTP's initiatives, and the objective of this study, was to develop flowsheets for prototype, integrated, mixed-waste treatment facilities that can serve as models for sites developing their own treatment strategies. Evaluation of these flowsheets is being facilitated through the use of computer modeling. The objectives of the flowsheet simulations are to compare process effectiveness and costs of alternative flowsheets and to determine if commercial process-simulation software could be used on the large, complex process of an integrated mixed waste processing facility. Flowsheet modeling is needed to evaluate many aspects of proposed flowsheet designs. A major advantage of modeling the complete flowsheet is the ability to define the internal recycle streams, thereby making it possible to evaluate the impact of one operation on the whole plant. Many effects that can be seen only in this way. Modeling also can be used to evaluate sensitivity and range of operating conditions, radioactive criticality, and relative costs of different flowsheet designs. Further, the modeled flowsheets must be easily modified so that one can examine how alternative technologies and varying feed streams affect the overall integrated process.

718 (UCRL-JC-119133) Mediated electrochemical oxidation as an alternative to incineration for mixed wastes. Chiba, Z.; Schumacher, B.; Lewis, P.; Murguia, L. Lawrence Livermore National Lab., CA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract W-7405-ENG-48. (CONF-9503102-1: Waste management symposia, Tucson, AZ (United States), 1 Mar 1995). Order Number DE95008369. Source: OSTI; NTIS; INIS; GPO Dep.

Mediated Electrochemical Oxidation (MEO) is an aqueous process which oxidizes organics electrochemically at low temperatures and ambient pressures. The process can be used to treat mixed wastes containing hazardous organics by destroying the organic components of the wastes. The radioactive components of the wastes are dissolved in the electrolyte where they can be recovered if desired, or immobilized for disposal. The process of destroying organics is accomplished via a mediator, which is in the form of metallic ions in solution. At Lawrence Livermore National Laboratory (LLNL) we have worked with several mediators, including silver, cobalt and cerium. We have tested mediators in nitric as well as sulfuric acids. We have recently completed extensive experimental studies on cobalt-sulfuric acid and silver-nitric acid systems for destroying the major organic components of Rocky Flats Plant combustible mixed wastes. Organics tested were: Trimsol (a cutting oil), cellulose (including paper and cloth), rubber (latex), plastics (Tyvek, polyethylene and polyvinyl chloride) and biomass (bacteria). The process was capable of destroying almost all of the organics tested, attaining high destruction efficiencies at reasonable coulombic efficiencies. The only exception was polyvinyl chloride, which was destroyed very slowly resulting in poor coulombic efficiencies. Besides the process development work mentioned above, we are working on the design of a pilot-plant scale integrated system to be installed in the Mixed Waste Management Facility (MWMF) at LLNL. The system will also be completely integrated with upstream and downstream processes (for example, feed preparation, off-gas and water treatment, and final forms encapsulation). The conceptual design for the NEO-MWMF system has been completed and preliminary design work has been initiated. Demonstration of the process with low-level mixed wastes is expected to commence in 1998.

719 (WHC-EP-0125-6) Summary of radioactive solid waste received in the 200 Areas during calendar year 1993. Anderson, J.D.; Hagel, D.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 282p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000429. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company manages and operates the Hanford Site 200 Areas radioactive solid waste storage and disposal facilities for the US Department of Energy, Richland Operations Office. These facilities include radioactive solid waste disposal sites and radioactive solid waste storage areas. This document summarizes the amount of radioactive materials that have been buried and stored in the 200 Areas radioactive solid waste storage and disposal facilities since startup in 1944 through calendar year 1993. This report does not include backlog waste, solid radioactive waste in storage or disposed of in other areas, or facilities such as the underground tank farms. Unless packaged within the scope of WHC-EP-0063, "Hanford Site Solid Waste Acceptance Criteria," (WHC 1988), liquid waste data are not included in this document.

720 (WHC-EP-0460) Feasibility study for the processing of Hanford Site cesium and strontium isotopic sources in the Hanford Waste Vitrification Plant. Anantatmula, R.P. (Westinghouse Hanford Co., Richland, WA (United States)); Watrous, R.A.; Nelson, J.L.; Perez, J.M.;

Peters, R.D.; Peterson, M.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1991. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001296. Source: OSTI; NTIS; INIS; GPO Dep.

The final environmental impact statement for the disposal of defense-related wastes at the Hanford Site (Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes [HDW-EIS] [DOE 1987]) states that the preferred alternative for disposal of cesium and strontium wastes at the Hanford Site will be to package and ship these wastes to the commercial high-level waste repository. The Record of Decision for this EIS states that before shipment to a geologic repository, these wastes will be packaged in accordance with repository waste acceptance criteria. However, the high cost per canister for repository disposal and uncertainty about the acceptability of overpacked capsules by the repository suggest that additional alternative means of disposal be considered. Vittrification of the cesium and strontium salts in the Hanford Waste Vittrification Plant (HWVP) has been identified as a possible alternative to overpacking. Subsequently, Westinghouse Hanford Company's (Westinghouse Hanford) Projects Technical Support Office undertook a feasibility study to determine if any significant technical issues preclude the vittrification of the cesium and strontium salts. Based on the information presented in this report, it is considered technically feasible to blend the cesium chloride and strontium fluoride salts with neutralized current acid waste (NCAW) and/or complexant concentrate (CC) waste feedstreams, or to blend the salts with fresh frit and process the waste through the HWVP.

721 (WHC-EP-0527-3) **Environmental releases for calendar year 1993.** Thomas, S.P.; Curn, B.L. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001314. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents data on radioactive and nonradioactive materials released into the environment during calendar year 1993 from facilities managed by Westinghouse Hanford Company. As part of this executive summary, comprehensive data summaries of air emissions and liquid effluents in 1993 are displayed in tables. These tables represent the following: radionuclide air emissions data; data on radioactive liquid effluents discharged to the soil; radionuclides discharged to the Columbia River; nonradioactive air emissions data; total volumes and flow rates of 200/600 area liquid effluents. Both summary and detailed presentations of these data are given. When appropriate, comparisons to data from previous years are made.

722 (WHC-EP-0802) **1994 Solid waste forecast summary: Waste characteristics and treatability groups.** Valero, O.J. (Westinghouse Hanford Co., Richland, WA (United States)); Williams, N.C.; Armacost, L.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 292p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002473. Source: OSTI; NTIS; INIS; GPO Dep.

This document, prepared by Pacific Northwest Laboratory (PNL) under the direction of Westinghouse Hanford Company (WHC), describes the characteristics of the low-level mixed solid waste (LLMW) and transuranic/transuranic mixed solid waste (TRU/TRUM) that will be received at Hanford's Solid Waste Operations Complex (SWOC). This waste

will be generated over the next 30 years from operations, maintenance activities, deactivation activities, decontamination and decommissioning (D&D) of facilities, and environmental restoration (ER) activities. For the past 4 years, each onsite and offsite waste generator has provided an annual forecast of the waste volume that is scheduled to be shipped to Hanford's Solid Waste Operations Complex (SWOC) over the next 30 years. The generator's forecast includes the waste volumes, waste classes, physical waste forms, hazardous constituents, and container types. Certain waste generators had a difficult time predicting their future waste volumes. Therefore, special studies and interviews were conducted to obtain these volumes. This document, based primarily on the 1993 forecasts, describes the physical waste forms and hazardous constituents for the low-level mixed waste (LLMW) and the transuranic/transuranic mixed waste (TRU/TRUM) that will be shipped to Hanford's SWOC. In addition, it illustrates how mixed waste is categorized into nationally established treatability groups. Defining the waste characteristics and categorizing the waste into treatability groups allows management and treatment planners to plan for future waste management activities and evaluate alternative treatment strategies.

723 (WHC-EP-0803) **1994 Solid waste forecast container volume summary.** Templeton, K.J.; Clary, J.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000436. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a 30-year forecast of the solid waste volumes by container type. The volumes described are low-level mixed waste (LLMW) and transuranic/transuranic mixed (TRU/TRUM) waste. These volumes and their associated container types will be generated or received at the US Department of Energy Hanford Site for storage, treatment, and disposal at Westinghouse Hanford Company's Solid Waste Operations Complex (SWOC) during a 30-year period from FY 1994 through FY 2023. The forecast data for the 30-year period indicates that approximately 307,150 m³ of LLMW and TRU/TRUM waste will be managed by the SWOC. The main container type for this waste is 55-gallon drums, which will be used to ship 36% of the LLMW and TRU/TRUM waste. The main waste generator forecasting the use of 55-gallon drums is Past Practice Remediation. This waste will be generated by the Environmental Restoration Program during remediation of Hanford's past practice sites. Although Past Practice Remediation is the primary generator of 55-gallon drums, most waste generators are planning to ship some percentage of their waste in 55-gallon drums. Long-length equipment containers (LECs) are forecasted to contain 32% of the LLMW and TRU/TRUM waste. The main waste generator forecasting the use of LECs is the Long-Length Equipment waste generator, which is responsible for retrieving contaminated long-length equipment from the tank farms. Boxes are forecasted to contain 21% of the waste. These containers are primarily forecasted for use by the Environmental Restoration Operations—D&D of Surplus Facilities waste generator. This waste generator is responsible for the solid waste generated during decontamination and decommissioning (D&D) of the facilities currently on the Surplus Facilities Program Plan. The remaining LLMW and TRU/TRUM waste volume is planned to be shipped in casks and other miscellaneous containers.

724 (WHC-EP-0804) Corrosion assessment of dry fuel storage containers. Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001988. Source: OSTI; NTIS; INIS; GPO Dep.

The structural stability as a function of expected corrosion degradation of 75 dry fuel storage containers located in the 200 Area Low-Level Waste Burial Grounds was evaluated. These containers include 22 concrete burial containers, 13 55-gal (208-l) drums, and 40 Experimental Breeder Reactor II (EBR-II) transport/storage casks. All containers are buried beneath at least 48 in. of soil and a heavy plastic tarp with the exception of 35 of the EBR-II casks which are exposed to atmosphere. A literature review revealed that little general corrosion is expected and pitting corrosion of the carbon steel used as the exterior shell for all containers (with the exception of the concrete containers) will occur at a maximum rate of 3.5 mil/yr. Penetration from pitting of the exterior shell of the 208-l drums and EBR-II casks is calculated to occur after 18 and 71 years of burial, respectively. The internal construction beneath the shell would be expected to preclude containment breach, however, for the drums and casks. The estimates for structural failure of the external shells, large-scale shell deterioration due to corrosion, are considerably longer, 39 and 150 years respectively for the drums and casks. The concrete burial containers are expected to withstand a service life of 50 years.

725 (WHC-EP-0845) Solid waste management history of the Hanford Site. Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 320p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010114. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to summarize and document the management of solid radioactive waste from 1944 to the present. This report includes the following topics: The scope of solid waste management practices and the changes in these practices with time; waste categorization; the history of waste management requirements, including waste management laws, policies, and orders; waste acceptance criteria; how different waste types were handled and packaged; the types of containers used for waste packaging; disposal practices, including detailed descriptions of burial and storage facilities; and the various forms of documentation required for solid waste storage or disposal.

726 (WHC-SA-1787) Mixed waste solidification testing on thermosetting polymer and cement based waste forms in support of Hanford's WRAP Module 2A Facility. Burbank, D.A.; Weingardt, K.M. Westinghouse Hanford Co., Richland, WA (United States). Mar 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930873-33: 2. international mixed waste symposium, Baltimore, MD (United States), 17-20 Aug 1993). Order Number DE94013230. Source: OSTI; NTIS; INIS; GPO Dep.

A testing program has been conducted by the Westinghouse Hanford Company to confirm the baseline waste form selection for use in Waste Receiving and Processing (WRAP) Module 2A. WRAP Module 2A will provide treatment required to properly dispose of containerized contact-handled, mixed low-level waste at the US Department of Energy Hanford Site in south-central Washington State. Solidification/stabilization has been chosen as the appropriate treatment for this waste. This work is intended to

test cement-based and thermosetting polymer solidification media to confirm the baseline technologies selected for WRAP Module 2A. Screening tests were performed using the major chemical constituent of each waste type to measure the gross compatibility with the immobilization media and to determine formulations for more detailed testing. Surrogate wastes representing each of the eight waste types were prepared for testing. Surrogates for polymer testing were sent to a vendor commissioned for that portion of the test work. Surrogates for the grout testing were used in the Westinghouse Hanford Company laboratory responsible for the grout performance testing. Detailed discussion of the laboratory work and results are contained in this report.

727 (WHC-SA-1987) In situ chemical characterization of waste sludges using FTIR-based fiber optic sensors. Rebagay, T.V.; Dodd, D.A.; Jeppson, D.W.; Lockrem, L.L.; Blewett, G.R. Westinghouse Hanford Co., Richland, WA (United States). Feb 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940209-4: Pittsburgh conference on analytical chemistry and applied spectroscopy, Chicago, IL (United States), 28 Feb - 4 Mar 1994). Order Number DE94012401. Source: OSTI; NTIS; INIS; GPO Dep.

The characterization of unknown mixed wastes is a mandatory step in today's climate of strict environmental regulations. Cleaning up the nuclear and chemical wastes that have accumulated for 50 years at the Hanford Site is the largest single cleanup task in the United States today. The wastes are stored temporarily in carbon steel single- and double-shell tanks that are buried in tank farms at the Site. In the 1950s, a process to scavenge radioactive cesium and other soluble radionuclides in the wastes was developed to create additional tank space for waste storage. This scavenging process involved treatment of the wastes with alkali cyanoferrates and nickel sulfate to precipitate ¹³⁷Cs in the presence of nitrate oxidant. Recent safety issues have focused on the stability of cyanoferrate-bearing wastes with large quantities of nitrates and nitrites. Nitrate has been partially converted to nitrite as a result of radiolysis during more than 35 years of storage. The major safety issue is the possibility of the presence of local hot spots enriched in ¹³⁷Cs and ⁹⁰Sr that under optimum conditions can self-heat causing dry out and a potential runaway reaction of the cyanoferrates with the nitrates/nitrites. For waste tank safety, accurate data of the concentration and distribution of cyanoferrates in the tanks are needed. Because of the extensive sampling required and the highly restricted activities allowed in the tank farms, simulated tank wastes are used to provide an initial basis for identifying and quantifying realistic concerns prior to waste remediation. Fiber optics provide a tool for the remote and in situ characterization of hazardous and toxic materials. This study is focused on near-infrared (NIR) and mid-infrared (MIR) fiber optic sensors for in situ chemical characterization of Hanford Site waste sludges.

728 (WHC-SA-2162) Qualitative evaluation of heavy metals in soils using portable XRF instruments. McCain, R.G. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931122-2: Superfund 14: conference and exhibition, Washington, DC (United States), 30 Nov - 2 Dec 1993). Order Number DE94013250. Source: OSTI; NTIS; INIS; GPO Dep.

Portable isotope-source energy dispersive x-ray fluorescence (XRF) analyzers can provide rapid on site screening

for heavy metals in soils. Their use generally involves empirical calibration to a suite of representative soil samples spiked with a range of concentrations of the analytes of interest. In most cases, only a limited number of analytes can be measured with this approach, because of constraints imposed by the operational software and costs associated with preparing the calibration suite. A simple approach is described that provides a qualitative indication of anomalous concentrations of heavy metals based on numeric comparison of gross count rates to background values. This approach can rapidly identify contaminated soils and does not depend on a suite of calibration samples. Direct measurements can be made to rapidly map soil contamination without sample collection, and the method can also be applied to other surfaces such as concrete.

729 (WHC-SA-2221) Testing of a Peroxidation Systems, Inc. perox-pure SSB-30. Hodgson, K.M.; Lunsford, T.R. Westinghouse Hanford Co., Richland, WA (United States). Feb 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940248-2: 4. annual symposium on chemical oxidation, Nashville, TN (United States), 16-18 Feb 1994). Order Number DE94016467. Source: OSTI; NTIS; INIS; GPO Dep.

A facility is being designed and built at the US Department of Energy (DOE) Hanford Site to treat water containing a variety of organic and inorganic compounds. An ultraviolet light/hydrogen peroxide system, manufactured by Peroxidation Systems, Inc. (PSI), has been chosen to destroy the organic compounds in the feed stream. The PSI perox-pure™ model SSB-30 has been tested by the Westinghouse Hanford Company (WHC) to provide data for permit documentation and to determine appropriate operating conditions. The destruction of the organic compounds was demonstrated with several feed compositions at different ultraviolet light exposures and hydrogen peroxide concentrations.

730 (WHC-SA-2235) A team leadership approach to managing the transition from construction to operations for an environmental project. Kelly, J.W. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941091-2: 25. Project Management Institute annual seminar and symposium, Vancouver (Canada), 17-19 Oct 1994). Order Number DE94018150. Source: OSTI; NTIS; INIS; GPO Dep.

This presentation describes a team approach, at the total-project level that focused team members with common objectives, for the transition to start-up and operation of the project. The Integrated Management Team (IMT) approach has been successful for this US Department of Energy (DOE) environmental restoration project at the Hanford Site in Richland, Washington. The \$53.8-million project will collect, treat, and dispose of low-level mixed waste water discharges from the Hanford Site. Construction is scheduled for completion in September 1994 and facility start-up in June 1995. The project challenge is for leadership that is committed to the transition from construction to operation of the environmental restoration project.

731 (WHC-SA-2241) The long-term climate change task of the Hanford permanent isolation barrier development program. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941124-6: 33. Hanford symposium on

health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94015637. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Permanent Isolation Barrier Development Program is developing an in-place disposal capability for low-level nuclear waste for the US Department of Energy at the Hanford Site in southeastern Washington State. Layered earthen and engineered barriers are being developed that will function in what is currently a semiarid environment (mean annual precipitation and temperature of 16 cm and 11.8°C, respectively) for at least 1,000 yr by limiting the infiltration of water through the waste. The Long-Term Climate Change Task has specific goals of (1) obtaining defensible probabilistic projections of the long-term climate variability in the Hanford Site region at many different time scales into the future; (2) developing several test-case climate scenarios that bracket the range of potential future climate, including both greenhouse warming and cycling into another ice age; and (3) using the climate scenarios both to test and to model protective barrier performance. Results from the Carp Lake Pollen Coring Project indicate that for the last approximately 100,000 yr the Columbia River Basin's long-term range of mean annual precipitation ranged from 25%–50% below to 28% above modern levels, while temperature has ranged from 7°C–10°C below to 2°C above modern levels. This long record provides confidence that such a range should bracket potential natural climate change even if the earth cycles back into another Ice Age in the next few millennia.

732 (WHC-SA-2292) In situ radiological characterization to support a test excavation at a liquid waste disposal site. Keele, B.D.; Bauer, R.G.; Blewett, G.R.; Troyer, G.L. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940524-14: 8. symposium on radiation measurements and applications, Ann Arbor, MI (United States), 16-19 May 1994). Order Number DE94016474. Source: OSTI; NTIS; INIS; GPO Dep.

An in situ radiological detection system was developed to support a small test excavation at a liquid waste disposal site at the Hanford Site in Richland, Washington. Instrumentation, calibration and comparisons to samples are discussed.

733 (WHC-SA-2355) Qualification of radionuclide inventory based on measured dose rates. Gedeon, S.R.; Hetzer, D.C.; Bunch, W.L.; Carter, L.L.; Lan, J.S.; Greenborg, J.; Waltar, A.E. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-41: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013880. Source: OSTI; NTIS; INIS; GPO Dep.

Disposition of low-level solid waste packages at the Hanford Site requires quantifying the radioactive contents of each container. Correlations and uncertainties are applied to the dose rate information at the container surface to differentiate low activity waste. The higher activity waste containers are subsequently examined with more refined techniques.

734 (WHC-SA-2406) Source term development for the 300 Area Treated Effluent Disposal Facility. Bendixsen, R.B. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. (CONF-9406159-2: Integrated risk management: working toward a common process workshop, Albuquerque, NM (United States), 8-10 Jun 1994). Order Number DE94013227. Source: OSTI; NTIS; INIS; GPO Dep.

A novel method for developing a source term for radiation and hazardous material content of sludge processing equipment and barrels in a new waste water treatment facility is presented in this paper. The 300 Area Treated Effluent Disposal Facility (TEDF), located at the Hanford Site near Richland, Washington, will treat process sewer waste water from the 300 Area and discharge a permittable effluent flow into the Columbia River. A process information and hazards analysis document needed a process flowsheet detailing the concentrations of radionuclides, inorganics, and organics throughout the process, including the sludge effluent flow. A hazards analysis for a processing facility usually includes a flowsheet showing the process, materials, heat balances, and instrumentation for that facility. The flow sheet estimates stream flow quantities, activities, compositions, and properties. For the 300 Area TEDF, it was necessary to prepare the flow sheet with all of the information so that radiation doses to workers could be estimated. The noble method used to develop the 300 Area TEDF flowsheet included generating recycle factors. To prepare each component in the flowsheet, precipitation, destruction, and two recycle factors were developed. The factors were entered into a spreadsheet and provided a method of estimating the steady-state concentrations of all of the components in the facility. This report describes how the factors were developed, explains how they were used in developing the flowsheet, and presents the results of using these values to estimate radiation doses for personnel working in the facility. The report concludes with a discussion of the effect of estimates of radioactive and hazardous material concentrations on shielding design and the need for containment features for equipment in the facility.

735 (WHC-SA-2435) CO₂ pellet decontamination technology at Westinghouse Hanford. Aldridge, T.L.; Aldrich, L.K. II; Bowman, E.V. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940505-1: 3. international workshop on implementation of ALARA at nuclear power plants, Long Island, NY (United States), 8-11 May 1994). Order Number DE94013972. Source: OSTI; NTIS; INIS; GPO Dep.

Experimentation and testing with CO₂ pellet decontamination technology is being conducted at Westinghouse Hanford Company (WHC), Richland, Washington. There are 1100 known existing waste sites at Hanford. The sites specified by federal and state agencies are currently being studied to determine the appropriate cleanup methods best for each site. These sites are contaminated and work on them is in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). There are also 63 treatment, storage, and disposal units, for example: groups of waste tanks or drums. In 1992, there were 100 planned activities scheduled to bring these units into the Resource Conservation and Recovery Act (RCRA) compliance or close them after waste removal. Ninety-six of these were completed. The remaining four were delayed or are being negotiated with regulatory agencies. As a result of past defense program activities at Hanford a tremendous volume of materials and equipment have accumulated and require remediation.

736 (WHC-SA-2518) Radioactive check sources for alpha and beta sensitive radiological instrumentation. Barnett, J.M.; Kane, J.E. II. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9406210-3: Health Physics Society annual meeting, San Francisco, CA (United States), 27-30 Jun 1994). Order Number DE94016477. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1991, the Westinghouse Hanford Company has examined the construction and use of alpha and beta radioactive check sources for calibrating instruments and for performing response checks of instruments used for operational and environmental radiation detection. The purpose of using a radioactive check source is to characterize the response of a radiation monitoring instrument in the presence of radioactivity. To accurately calibrate the instrument and check its response, the check source used must emulate as closely as possible the actual physical and isotopic conditions being monitored. The isotope employed and the physical methods used to fabricate the check source (among other factors) determine instrument response. Although information from applicable national and international standards, journal articles, books, and government documents was considered, empirical data collected is most valuable when considering the type of source to use for a particular application. This paper presents source construction methods, use considerations, and standard recommendations. The results of a Hanford Site evaluation of several types of alpha and beta sources are also given.

737 (WHC-SA-2543) Design of the Waste Receiving and Processing (WRAP) 2A Facility. Lamberd, D.L.; Weingardt, K.M. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940853-8: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive and Hazardous Mixed Waste have accumulated at the US Department of Energy (DOE) Hanford Site in south-central Washington State. Future generated waste streams from planned facilities at the Hanford Site and off site will also generate solid wastes that contain both radiological and hazardous chemical components. Most of the low-level waste (LLW) in this category is generated in batches sized to be stored in smaller containers (mostly 55-gallon drums and boxes). To meet the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions, most of this waste will need to be treated to meet disposal requirements. In general this treatment must include stabilization/solidification either as a sole method or as part of a treatment train. A planned DOE facility, the Waste Receiving and Processing (WRAP) Module 2A, Building 2337-W, is scoped to provide this required treatment for containerized contact-handled (CH), mixed low-level waste (MLLW) at the Hanford Site. The core processes in WRAP Module 2A include cement stabilization of particulate waste, polyethylene encapsulation (via extrusion) of particulate waste, and cement encapsulation (via vibratory infilling) of hard and soft debris. A conceptual design was prepared and issued in July 1992. Since that time, process development test activities and further design iterations have evolved into the optimized process and facility design presented in this paper. This paper will discuss the revised processing scheme, equipment configuration, and facility layout. The

WRAP Module 2A will begin construction in 1996 after a detailed design effort and pilot testing activities.

738 (WHC-SA-2624) Hanford's Radioactive Mixed Waste Disposal Facility. McKenney, D.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-1: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE94018684. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy has been in a mode of interim storage of mixed wastes at Hanford, this facility represents the first step towards a final solution (disposal). Qualified wastes currently in storage at Hanford can now be disposed of, and development and implementation of waste treatment processes can proceed now that a facility exists which can receive mixed waste residues. Trench #31 will also allow disposal of mixed wastes resulting from remediation activities, and thus supports the Hanford Restoration mission. This facility can also serve as an important pilot test of disposal technologies to be used to support full scale remediation operations.

739 (WHC-SA-2666) G3 model of gas and liquid migration from grout containing radioactive waste. Roblyer, S.P.; Finfrock, S.H.; Powell, W.J. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950420-12: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 May 1995). Order Number DE95004511. Source: OSTI; NTIS; INIS; GPO Dep.

Grout has been evaluated as a means of containing low-level radioactive waste for long-term disposal. Concerns about hydrogen and reactive gas generation in the Hanford Site grout disposal facility lead to the development of the G3 model, which has predicted buildup of radiolytically formed gases in the grout region and their migration to air-filled regions. The G3 model is a one-dimensional code that couples models of gas diffusion with two-phase gas and liquid flow. It was coupled to a compartment diffusion model and these models predicted the concentrations of hydrogen, nitrous oxide, and other gases in air-filled regions of the grout disposal facility. The results have served as the technical basis for safety studies. A unique finding of the G3 model was that a liquid return, or expulsion of unbound liquid from the grout region, could occur. This liquid return is driven by displacement caused by gas bubbles that form within the grout's microstructure. Liquid return is very sensitive to the level of gas production, the geometry and design of the grout region, and the material properties of the grout. Experimental evidence and observations that support code predictions will be discussed in this paper.

740 (WHC-SA-2675) LLW solidification in cement: Effect of dilution. Kruger, A.A. (Westinghouse Hanford Co., Richland, WA (United States)); Katz, A.; Brough, A.R.; Bakharev, T.; Kirkpatrick, R.J.; Struble, L.J.; Young, J.F. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Grant MJGSVV-097600. (CONF-941144-120: Fall meeting of the Materials Research Society, Boston, MA (United States), 28 Nov - 2 Dec 1994). Order Number DE95010108. Source: OSTI; NTIS; INIS; GPO Dep.

A simulated Low Level nuclear Waste (LLW) solution was tested for long term solidification in a cement-based matrix. The waste is characterized by high pH and high concentrations of sodium, aluminum, nitrate, nitrite, phosphate and carbonate. The effect of diluting the waste with additional water was studied. The cementitious matrix was composed of cement, fly-ash and clay (21%, 68% and 11% respectively) with high solution to solid ratio (1 liter /1 kg.). Mixes were prepared at 45°C and cured at 90°C for 28 days. Maximum 28 day compressive strengths and early age heat evolution were achieved by diluting the LLW solution to approximately 67% of its original concentration. More dilution led to a lower heat evolution and compressive strength. No dilution was found to give lower compressive strength, and a heat evolution that was delayed, and lower in intensity. XRD spectra showed formation of zeolites and tobermorite at the higher concentrations (67, 85, and 100% of the concentration of the undiluted simulated LLW), with a change from Na-Pl zeolite for 67% of the undiluted concentration to a sodalite at 100%. SEM observations showed a porous system for the low and high dilution rates but a less porous one for an intermediate level of dilution.

741 (WHC-SA-2676) Microstructural aspects of zeolite formation in alkali activated cements containing high levels of fly ash. Kruger, A.A. (Westinghouse Hanford Co., Richland, WA (United States)); Brough, A.R.; Katz, A.; Bakharev, T.; Sun, G.K.; Kirkpatrick, R.J.; Struble, L.J.; Young, J.F. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941144-122: Fall meeting of the Materials Research Society, Boston, MA (United States), 28 Nov - 2 Dec 1994). Order Number DE95010107. Source: OSTI; NTIS; INIS; GPO Dep.

Wasteforms made by reaction at elevated temperature of a highly simulated low level nuclear waste solution, having high sodium ion concentration, with a cementitious blend high in fly ash have been studied. Significant formation of Na-P1 zeolite (gismondine framework) and of a sodalite occurred. The time evolution of the crystalline phases over the first 28 days is reported for both adiabatic and isothermal curing, and the role of these phases in microstructure development is discussed. The level of carbonate ions in solution was found to have a substantial effect on strength evolution and chemistry.

742 (WHC-SA-2756) Achievement of process control, safety, and regulatory compliance in a mixed waste evaporator system at the Hanford Site using data quality objectives. Von Barga, B.H. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-3: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95005983. Source: OSTI; NTIS; INIS; GPO Dep.

The Data Quality Objectives (DQO) Process was applied to the operation of the 242-A Evaporator at the Hanford Site. A team consisting of representatives from process engineering, environmental engineering, regulatory compliance, analytical laboratories, and DOE utilized the step by step DQO process to define the issues, variables, and inputs necessary to develop the decision rules which govern plant operations. The sampling and analyses required to

make these decisions was then optimized concerning factors such as sample number, total analyses, cost, radiation exposure, quality assurance, and deliverables.

743 (WHC-SD-C018H-TRP-015) The effect of dissolved solids on the destruction of organics by ultraviolet oxidation. Hyatt, N.M. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010564. Source: OSTI; NTIS; INIS; GPO Dep.

The 200 Area Effluent Treatment Facility (ETF) was designed and built to treat and dispose of the 242-A evaporator process condensate (PC). Because of the robustness of the facility, there is the possibility of utilizing it to treat not only the PC, but also various waste waters generated during the environmental restoration of the Hanford site. These waste waters could include purge water/groundwater and fuel basin water. The groundwater at the Hanford site is contaminated with organic chemicals such as carbon tetrachloride. It also contains a high level of nitrates. The ETF is a proposed means to treat this contaminated groundwater with the organics being destroyed in the ultraviolet oxidation (UV/OX) process. Nitrates are known to absorb ultraviolet (UV) light. Because the ETF will be adding sulfuric acid as pH adjustment and treating waste water streams with ammonia and nitrate, it is prudent that the individual effects of these constituents on the organic oxidation rates be understood. Four series of tests were derived to determine the effects of dissolved solids on the destruction of organic chemicals in the UV/OX process. These were as follows: (1) volatilization test to verify that organic volatilization was not occurring; (2) UV transmittance tests to study effects of various levels of dissolved solids on the transmittance of UV light through the test solution; (3) baseline kinetic tests to establish baseline oxidation rates without the presence of dissolved solids; and (4) kinetic tests with dissolved solids present to study effects of the dissolved solids on the organic oxidation. The conclusions show that nitrate is the ion which causes the greatest decrease in oxidation rate. Sodium, sulfate, and ammonium will minimally influence the oxidation rate. These results can be used in developing a comprehensive model in the future.

744 (WHC-SD-CP-PLN-025) Low-level waste certification plan for the WSCF Laboratory Complex. Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001306. Source: OSTI; NTIS; INIS; GPO Dep.

The solid, low-level waste certification plan for the Waste Sampling and Characterization Facility (WSCF) describes the organization and methodology for the certification of the solid low-level waste (LLW) that is transferred to the Hanford Site 200 Areas Storage and Disposal Facilities. This plan incorporates the applicable elements of waste reduction, including up-front minimization, and end product treatment to reduce the volume or toxicity of the waste. The plan also includes segregation of different waste types. This low-level waste certification plan applies only to waste generated in, or is the responsibility of the WSCF Laboratory Complex. The WSCF Laboratory Complex supports technical activities performed at the Hanford Site. Wet Chemical and radiochemical analyses are performed to support site operations, including environmental and effluent monitoring, chemical processing, RCRA and CERCLA analysis, and waste management activities. Environmental and effluent samples

include liquid effluents, ground and surface waters, soils, animals, vegetation, and air filters.

745 (WHC-SD-CP-PLN-026) Low-level waste characterization plan for the WSCF Laboratory Complex. Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002081. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Characterization Plan for the Waste Sampling and Characterization Facility (WSCF) complex describes the organization and methodology for characterization of all waste streams that are transferred from the WSCF Laboratory Complex to the Hanford Site 200 Areas Storage and Disposal Facilities. Waste generated at the WSCF complex typically originates from analytical or radiological procedures. Process knowledge is derived from these operations and should be considered an accurate description of WSCF generated waste. Sample contribution is accounted for in the laboratory waste designation process and unused or excess samples are returned to the originator for disposal. The report describes procedures and processes common to all waste streams; individual waste streams; and radionuclide characterization methodology.

746 (WHC-SD-CP-QAPP-015) Quality assurance program plan for low-level waste at the WSCF Laboratory. Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002082. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide guidance for the implementation of the Quality Assurance Program Plan (QAPP) for the management of low-level waste at the Waste Sampling and Characterization Facility (WSCF) Laboratory Complex as required by WHC-CM-4-2, Quality Assurance Manual, which is based on Quality Assurance Program Requirements for Nuclear Facilities, NQA-1 (ASME).

747 (WHC-SD-EN-AP-117) In-well vapor stripping drilling and characterization work plan. Kogler, K.J. Westinghouse Hanford Co., Richland, WA (United States). 13 Mar 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94012937. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan provides the information necessary for drilling, sampling, and hydrologic testing of wells to be completed in support of a demonstration of the in-well vapor stripping system. The in-well vapor stripping system is a remediation technology designed to preferentially extract volatile organic compounds (VOCs) from contaminated groundwater by converting them to a vapor phase. Air-lift pumping is used to lift and aerate groundwater within the well. The volatiles escaping the aerated water are drawn off by a slight vacuum and treated at the surface while the water is allowed to infiltrate the vadose zone back to the water table.

748 (WHC-SD-EN-AP-168) In Situ Permeable Flow Sensor Installation at 100-H description of work. Vaught, D.J. Westinghouse Hanford Co., Richland, WA (United States). 18 Apr 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013013. Source: OSTI; NTIS; INIS; GPO Dep.

This description of work details field activities associated with drilling four boreholes in the 100-HR-3 Operable Unit for placement of four In Situ Permeable Flow Sensors near the 183-H Basin. A sonic drill rig funded under a Cooperative Research and Development Agreement (CRADA) will be employed to drill the boreholes. This project includes installation of automatic data logging and telemetry equipment. Each Sensor will be supplied with a data logger at the surface which will be wired to a cellular phone on site or to an existing telemetry station to transmit data to a computer in 2440 Stevens Center. Power to operate the Sensors and data loggers will be supplied by a small gasoline or diesel generator. Processed data will be used to develop a three-dimensional flownet of the unconfined aquifer near and within the Columbia River influenced mixing zone.

749 (WHC-SD-EN-EV-030) Low-level waste certification plan. Greenhalph, W.O. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004497. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the organization and methodology for the certification of solid low-level waste (LLW) and mixed-waste (MW) generated at any of the facilities or major work activities of the Engineered Process Application (EPA) organization. The primary LLW and MW waste generating facility operated by EPA is the 377 Building. This plan does not cover the handling of hazardous or non-regulated waste, though they are mentioned at times for completeness.

750 (WHC-SD-EN-QAPP-003-Rev.2) Waste handling Quality Assurance Program Plan for Engineered Process Applications. Revision 2. Biyani, R.K. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010147. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes methods which Engineered Process Applications personnel use to ensure that waste managed by them is in accordance with WHC-EP-0063, Hanford Site Solid Waste Acceptance Criteria. Hazardous waste, low-level waste, and mixed waste are covered.

751 (WHC-SD-EN-RA-009) Qualitative risk assessment for the 100-KR-1 source operable unit. Naiknimbalkar, N.M. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019341. Source: OSTI; NTIS; INIS; GPO Dep.

The 100-KR-1 operable unit is located within the 100 Area of the Hanford Site. The 100 Area of the Hanford Site was included on the US Environmental Protection Agency's (EPA's) National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). This report provides the qualitative risk assessments for the high priority waste sites associated with this operable unit. The application of the HPPS at the 100-KR-1 operable unit is discussed in detail in the Remedial Investigation/Feasibility Study Work Plan for the 100-KR-1 Operable Unit (DOE-RL 1992).

752 (WHC-SD-EN-RPT-009) 200-UP-2 operable unit radiological surveys. Wendling, M.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Apr 1994. 47p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE94014120. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes and documents the results of the radiological surveys conducted from August 17 through December 16, 1993 over a partial area of the 200-UP-2 Operable Unit, 200-W Area, Hanford Site, Richland, Washington. In addition, this report explains the survey methodology of the Mobile Surface Contamination Monitor 11 (MSCM-II) and the Ultra Sonic Ranging And Data System (USRADS). The radiological survey of the 200-UP-2 Operable Unit was conducted by the Site Investigative Surveys/Environmental Restoration Health Physics Organization of the Westinghouse Hanford Company. The survey methodology for the majority of area was based on utilization of the MSCM-II or the USRADS for automated recording of the gross beta/gamma radiation levels at or near six (6) inches from the surface soil.

753 (WHC-SD-EN-TI-203) Summary of canister overheating incident at the Carbon Tetrachloride Expedited Response Action site. Driggers, S.A. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1994. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94009614. Source: OSTI; NTIS; GPO Dep.

The granular activated carbon (GAC)-filled canister that overheated was being used to adsorb carbon tetrachloride vapors drawn from a well near the 216-Z-9 Trench, a subsurface disposal site in the 200 West Area of the Hanford Site. The overheating incident resulted in a band of discolored paint on the exterior surface of the canister. Although there was no other known damage to equipment, no injuries to operating personnel, and no releases of hazardous materials, the incident is of concern because it was not anticipated. It also poses the possibility of release of carbon tetrachloride and other hazardous vapors if the incident were to recur. All soil vapor extraction system (VES) operations were halted until a better understanding of the cause of the incident could be determined and controls implemented to reduce the possibility of a recurrence. The focus of this report and the intent of all the activities associated with understanding the overheating incident has been to provide information that will allow safe restart of the VES operations, develop operational limits and controls to prevent recurrence of an overheating incident, and safely optimize recovery of carbon tetrachloride from the ground.

754 (WHC-SD-EN-TI-220) 100-B area technical baseline report. Carpenter, R.W. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 297p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018110. Source: OSTI; NTIS; INIS; GPO Dep.

This document supports the environmental remediation effort of the 100-B Area by providing remediation planners with key data that characterize the 100-B and 100-C Reactor sites. It provides operational histories of the 100-B and 100-C Reactors and each of their associated liquid and solid waste sites.

755 (WHC-SD-EN-TI-234) 100 Area excavation treatability study data validation report. Frain, J.M. Westinghouse Hanford Co., Richland, WA (United States). 19 May 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014117. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of sampling and chemical analyses at Hanford Reservation. The samples were analyzed by Thermo-Analytic Laboratories and Roy F. Weston Laboratories using US Environmental Protection Agency CLP protocols. Sample analyses included: volatile organics; semivolatile organics; inorganics; and general chemical parameters. The data from the chemical analyses were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site.

756 (WHC-SD-EN-TI-240) Vitrification testing of soil fines from contaminated Hanford 100 Area and 300 Area soils. Ludowise, J.D. Westinghouse Hanford Co., Richland, WA (United States). 1 May 1994. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013006. Source: OSTI; NTIS; INIS; GPO Dep.

The suitability of Hanford soil for vitrification is well known and has been demonstrated extensively in other work. The tests reported here were carried out to confirm the applicability of vitrification to the soil fines (a subset of the Hanford soil potentially different in composition from the bulk soil) and to provide data on the performance of actual, vitrified soil fines. It was determined that the soil fines were generally similar in composition to the bulk Hanford soil, although the fraction <0.25 mm in the 100 Area soil sample appears to differ somewhat from the bulk soil composition. The soil fines are readily melted into a homogeneous glass with the simple additions of CaO and/or Na₂O. The vitrified waste (plus additives) occupies only 60% of the volume of the initial untreated waste. Leach testing has shown the glasses made from the soil fines to be very durable relative to natural and man-made glasses and has demonstrated the ability of the vitrified waste to greatly reduce the release of radionuclides to the environment. Viscosity and electrical conductivity measurements indicate that the soil fines will be readily processable, although with levels of additives slightly greater than used in the radioactive melts. These tests demonstrate the applicability of vitrification to the contaminated soil fines and the exceptional performance of the waste form resulting from the vitrification of contaminated Hanford soils.

757 (WHC-SD-EN-TI-242) 2727-S Nonradioactive Dangerous Waste Storage Facility clean closure evaluation report. Luke, S.N. Westinghouse Hanford Co., Richland, WA (United States). 14 Jul 1994. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015754. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the analytical results of 2727-S NRDWS facility closure verification soil sampling and compares these results to clean closure criteria. The results of this comparison will determine if clean closure of the unit is regulatorily achievable. This report also serves to notify regulators that concentrations of some analytes at the site exceed sitewide background threshold levels (DOE-RL 1993b) and/or the limits of quantitation (LOQ). This report also presents a Model Toxics Control Act Cleanup (MTCA) (WAC 173-340) regulation health-based closure standard under which the unit can clean close in lieu of closure to background levels or LOQ in accordance with WAC 173-303-610. The health-based clean closure standard will be closure to MTCA Method B residential cleanup levels. This report reconciles all analyte concentrations reported above background or LOQ to this health-based cleanup standard. Regulator acceptance of the findings presented in this report

will qualify the TSD unit for clean closure in accordance with WAC 173-303-610 without further TSD unit soil sampling, or soil removal and/or decontamination. Nondetected analytes require no further evaluation.

758 (WHC-SD-EN-TI-245) Passive vapor extraction feasibility study. Rohay, V.J. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015672. Source: OSTI; NTIS; INIS; GPO Dep.

Demonstration of a passive vapor extraction remediation system is planned for sites in the 200 West Area used in the past for the disposal of waste liquids containing carbon tetrachloride. The passive vapor extraction units will consist of a 4-in.-diameter pipe, a check valve, a canister filled with granular activated carbon, and a wind turbine. The check valve will prevent inflow of air that otherwise would dilute the soil gas and make its subsequent extraction less efficient. The granular activated carbon is used to adsorb the carbon tetrachloride from the air. The wind turbine enhances extraction rates on windy days. Passive vapor extraction units will be designed and operated to meet all applicable or relevant and appropriate requirements. Based on a cost analysis, passive vapor extraction was found to be a cost-effective method for remediation of soils containing lower concentrations of volatile contaminants. Passive vapor extraction used on wells that average 10-stdft³/min air flow rates was found to be more cost effective than active vapor extraction for concentrations below 500 parts per million by volume (ppm) of carbon tetrachloride. For wells that average 5-stdft³/min air flow rates, passive vapor extraction is more cost effective below 100 ppm.

759 (WHC-SD-EN-TI-265) Carbon tetrachloride ERA soil-gas baseline monitoring. Fancher, J.D. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015335. Source: OSTI; NTIS; INIS; GPO Dep.

From December 1991 through December 1993, Westinghouse Hanford Company performed routine baseline monitoring of selected wells and soil-gas points twice weekly in the 200 West Area of the Hanford Site. This work supported the carbon Tetrachloride Expedited Response Action (ERA) and provided a solid baseline of volatile organic compound (VOC) concentrations in wells and in the subsurface at the ERA site. As site remediation continues, comparisons to this baseline can be one means of measuring the success of carbon tetrachloride vapor extraction. This report contains observations of the patterns and trends associated with data obtained during soil-gas monitoring at the 200 West Area. Monitoring performed since late 1991 includes monitoring soil-gas probes and wellheads for volatile organic compounds (VOCs). This report reflects monitoring data collected from December 1991 through December 1993.

760 (WHC-SD-EN-TI-277) 300-FF-1 Operable Unit physical separation of soils pilot plant study. Freeman-Pollard, J.R. Westinghouse Hanford Co., Richland, WA (United States). 15 Jan 1994. 183p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017325. Source: OSTI; NTIS; INIS; GPO Dep.

Alternative Remedial Technologies, Inc. (ART) was selected in a competitive selection process to conduct a pilot study for the physical separation of soils in the North Process Pond of the 300 Area at the Hanford Site. In January

1994, ART mobilized its 15 tons-per-hour pilot plant to the site. The plant was initially staged in a commercial area to allow for pretest inspections and minor modifications. The plant was specifically designed for use as a physical separations unit and consisted of a feed hopper, wet screens, hydrocyclones, as well as settling and dewatering equipment. The plant was supported in the field with prescreening equipment, mobile generators, air compressors, and water storage tanks. The plant was moved into the surface contamination area on March 24, 1994. The testing was conducted during the period March 23, 1994 through April 13, 1994. Two soil types were treated during the testing: a natural soil contaminated with low levels of uranium, cesium, cobalt, and heavy metals, and a natural soil contaminated with a uranium carbonate material that was visually recognizable by the presence of a green sludge material in the soil matrix. The "green" material contained significantly higher levels of the same contaminants. Both source materials were treated by the plant in a manner that fed the material, produced clean gravel and sand fractions, and concentrated the contaminants in a sludge cake. Process water was recycled during the operations. The testing was extremely successful in that for both source waste streams, it was demonstrated that volume reductions of greater than 90% could be achieved while also meeting the test performance criteria. The volume reduction for the natural soils averaged a 93.8%, while the "green" soils showed a 91.4% volume reduction.

761 (WHC-SD-EN-TI-282) Geophysical surveys for proposed boreholes 299-W15-25, 26 and 27, 200 West Area. Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005631. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the survey was to locate subsurface obstructions that may affect the drilling of the proposed boreholes 299-W15-25, 299-W15-26, and 299-W15-27, north of the 321-Z building. The possible drill sites within the zone with the least likelihood of encountering identified obstructions were identified based on the results of the survey. Ground-penetrating radar (GPR) was the geophysical method chosen for the shallow characterization of this site.

762 (WHC-SD-EN-TI-290) Geologic setting of the low-level burial grounds. Lindsey, K.A. (CH2M Hill Hanford, Inc., Richland, WA (United States)); Jaeger, G.K.; Slate, J.L.; Swett, K.J.; Mercer, R.B. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002156. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the regional and site specific geology of the Hanford Sites low-level burial grounds in the 200 East and West Areas. The report incorporates data from boreholes across the entire 200 Areas, integrating the geology of this area into a single framework. Geologic cross-sections, isopach maps, and structure contour maps of all major geological units from the top of the Columbia River Basalt Group to the surface are included. The physical properties and characteristics of the major suprabasalt sedimentary units also are discussed.

763 (WHC-SD-EN-TI-292) Calibration of the radionuclide logging system germanium detector. Randall, R.R. Westinghouse Hanford Co., Richland, WA (United

States). 5 Dec 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004512. Source: OSTI; NTIS; INIS; GPO Dep.

High resolution passive gamma-ray logging, high resolution gamma-ray-emitting nuclides in areas surrounding underground waste disposal facilities on the US Department of Energy's Hanford Site. Gamma-ray source concentrations are derived from log data by calculations that employ the calibration factors and correction functions described in this report. Calibration data were collected with a Radionuclide Logging System. Analyses of the calibration data established: (1) calibration factors for potassium, uranium, and thorium, and (2) a calibration function that permits assessments of cesium-137, cobalt-60, and other artificial nuclides not represented in the calibration models.

764 (WHC-SD-EN-TP-048) Integrated test plan for a shallow high resolution compressional seismic reflection demonstration. Narbutovskih, S.M. Westinghouse Hanford Co., Richland, WA (United States). 4 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019040. Source: OSTI; NTIS; INIS; GPO Dep.

This integrated test plan describes the demonstration of a surface high resolution seismic reflection acquisition system using swept source technology. Compressional wave data will be collected along a previously occupied seismic line associated with a recent seismic survey north of the 300 Area. The swept source system will be employed testing two very different high resolution vibrator sources, one with a frequency range from 10 to 500 Hz and a smaller unit with a range from 20 to 1,500 Hz. This will enable a precursory comparison of two vibrator data sets with standard impulse data. The data will be evaluated for the presence of reflected energy, signal strength, frequency content and signal-to-noise ratio. If the water table can be distinguished from the Hanford/Ringold formation contact, then the high permeability Hanford-filled channels can be mapped. Next, if details on the configuration of the Ringold middle mud can be discerned, this will allow detecting fluid pathway through the mud and confirm the depositional nature of this unit. Finally, by mapping the extent of the lower confining mud unit, areas where the polluted unconfined and lower confined aquifers communicate might be located. Another source and acquisition method will also be tested by gathering data along the same seismic line. This system uses a lightweight source that produces a high-velocity shock wave that strikes the earth's surface causing an acoustic wave to propagate downward. The acquisition method is nonconventional and is reported to eliminate obstructing noise such as groundroll and air blast. It is unexpected that this system will have the imaging ability of the vibratory systems. However it could prove to be economical for shallow applications when only compressional energy is needed.

765 (WHC-SD-EN-TP-049) 118-B-1 excavation treatability test procedures. Frain, J.M. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015752. Source: OSTI; NTIS; INIS; GPO Dep.

This treatability study has two purposes: to support development of the approach to be used for burial ground remediation, and to provide specific engineering information for the design of burial grounds receiving waste generated from the 100 Area removal actions. Data generated from

this test will also provide performance and cost information necessary for detailed analysis of alternatives for burial ground remediation. Further details on the test requirements, milestones and data quality objectives are described in detail in the 118-B-1 Excavation Treatability Test Plan (DOE/RL-94-43). These working procedures are intended for use by field personnel to implement the requirements of the milestone. A copy of the detailed Test Plan will be kept on file at the on-site field support trailer, and will be available for review by field personnel.

766 (WHC-SD-ER-TC-001) Laboratory procedures for waste form testing. Mast, E.S. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001562. Source: OSTI; NTIS; INIS; GPO Dep.

The 100 and 300 areas of the Hanford Site are included on the US Environmental Protection Agencies (EPA) National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Soil washing is a treatment process that is being considered for the remediation of the soil in these areas. Contaminated soil washing fines can be mixed or blended with cementations materials to produce stable waste forms that can be used for beneficial purposes in mixed or low-level waste landfills, burial trenches, environmental restoration sites, and other applications. This process has been termed co-disposal. The Co-Disposal Treatability Study Test Plan is designed to identify a range of cement-based formulations that could be used in disposal efforts in Hanford in co-disposal applications. The purpose of this document is to provide explicit procedural information for the testing of co-disposal formulations. This plan also provides a discussion of laboratory safety and quality assurance necessary to ensure safe, reproducible testing in the laboratory.

767 (WHC-SD-ETF-WAC-001) Acceptance of feed streams for treatment at the LERF/ETF complex. McDonald, F.N. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003995. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes a waste acceptance process for the storage and treatment of low-level liquid wastes in the LERF and ETF. It also discusses the steps that will be followed when evaluating a waste for storage and treatment.

768 (WHC-SD-HWV-PLN-002-Rev.5) B Plant complex hazardous, mixed and low level waste certification plan. Beam, T.G. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004161. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the administrative steps and handling methodology for certification of hazardous waste, mixed waste, and low level waste generated at B Plant Complex. The plan also provides the applicable elements of waste reduction and pollution prevention, including up front minimization and end product reduction of volume and/or toxicity. The plan is written to satisfy requirements for Hanford Site waste generators to have a waste certification program in place at their facility. This plan, as described, applies only to waste which is generated at, or is the responsibility of, B Plant Complex. The scope of this plan is

derived from the requirements found in WHC-EP-0063, Hanford Site Solid Waste Acceptance Criteria.

769 (WHC-SD-L045H-CSCM-001) Treated Effluent Disposal Facility (TEDF) Operator Training Station (OTS) System Configuration Management Plan. Carter, R.L. Jr. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003778. Source: OSTI; NTIS; GPO Dep.

The Treated Effluent Disposal Facility Operator Training Station (TEDF OTS) is a computer based training tool designed to aid plant operations and engineering staff in familiarizing themselves with the TEDF Central Control System (CCS). It consists of PC compatible computers and a Programmable Logic Controller (PLC) designed to emulate the responses of various plant components connected to or under the control of the CCS. The system trains operators by simulating the normal operation but also has the ability to force failures of different equipment allowing the operator to react and observe the events. The paper describes organization, responsibilities, system configuration management activities, software, and action plans for fully utilizing the simulation program.

770 (WHC-SD-L045H-CSDD-001) Computer software design description for the Treated Effluent Disposal Facility (TEDF), Project L-045H, Operator Training Station (OTS). Carter, R.L. Jr. Westinghouse Hanford Co., Richland, WA (United States). 7 Nov 1994. 278p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003065. Source: OSTI; NTIS; INIS; GPO Dep.

The Treated Effluent Disposal Facility (TEDF) Operator Training Station (OTS) is a computer-based training tool designed to aid plant operations and engineering staff in familiarizing themselves with the TEDF Central Control System (CCS).

771 (WHC-SD-L045H-CSWD-002) 300 Area Treated Effluent Disposal Facility computer software release cover sheet and revision record. McCarthy, R.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004154. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document contains the computer software release cover sheet and revision records for the 300 Area Treated Effluent Disposal Facility (TEDF). The previous revision was controlled by CH2M Hill which developed the software. A 7-page listing of the contents of directory C:\TEDF is contained in this report.

772 (WHC-SD-L045H-ER-003) Verification of best available technology for the 300 Area Treated Effluent Disposal Facility (310 Facility). Wagner, R.N. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000985. Source: OSTI; NTIS; INIS; GPO Dep.

This compilation of Project L-045H reference materials documents that the 300 Area Treated Effluent Disposal Facility (TEDF, also designated the 310 Facility) was designed, built, and will be operated in accordance with the best available technology (BAT) identified in the Engineering Summary Report. The facility is intended for treatment of 300 Area process sewer wastewater. The following unit operations for 300 Area process sewer water treatment are

specified as: influent receipt; iron co-precipitation and sludge handling for removal of heavy metals and initial suspended solids; ion exchanged for removal of mercury and other heavy metals; ultraviolet (UV)/peroxide treatment for destruction of organic compounds, cyanide, coliforms, sulfide, and nitrite; and effluent discharge to the Columbia River with pH monitoring/control capability.

773 (WHC-SD-L045H-OTR-001) Operability test report for the 300 Area Treated Effluent Disposal Facility. Schermerhorn, D.S. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 336p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002364. Source: OSTI; NTIS; GPO Dep.

This document is an operability test report for the 300 area of the Hanford Reservation known as the Treated Effluent Disposal Facility. Topics discussed include: procedures for operating the Treated Effluent Disposal Facility, unloading sludge storage tanks, operating the waste collection sump, plant shutdown and the final conditions.

774 (WHC-SD-L045H-PC-001) 300 Area treated effluent disposal facility operating specifications document. Olander, A.R. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001559. Source: OSTI; NTIS; INIS; GPO Dep.

These specifications deal with the release of treated water into the Columbia River via the TEDF submerged outfall. Specific limits are set for contaminants to be discharged in NPDES permit WA-002591-7. This section contains the operating ranges that will be used to best meet the permit limits.

775 (WHC-SD-L045H-PLN-004) 300 Area TEDF NPDES Permit Compliance Monitoring Plan. Loll, C.M. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002070. Source: OSTI; NTIS; INIS; GPO Dep.

This monitoring plan describes the activities and methods that will be employed at the 300 Area Treated Effluent Disposal Facility (TEDF) in order to ensure compliance with the National Discharge Elimination System (NPDES) permit. Included in this document are a brief description of the project, the specifics of the sampling effort, including the physical location and frequency of sampling, the support required for sampling, and the Quality Assurance (QA) protocols to be followed in the sampling procedures.

776 (WHC-SD-L045H-RPT-001) 300 Area TEDF DOE order compliance applicability assessment. Eacker, J.A. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003779. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of an effort to determine applicability of Department of Energy Orders at the Hanford 300 Area Treated Effluent Disposal Facility (TEDF). This assessment placed each of the reviewed orders into one of three compliance categories: (A) order applicable at a facility specific level (20 identified); (B) order applicable at a policy level (11 identified); or (C) order not applicable (21 identified). The scope of the assessment from the DOE Order standpoint was the 52 Level 1 Orders of interest to the

Defense Nuclear Facility Safety Board (DNFSB). Although the TEDF is a non-nuclear facility, this order basis was chosen as a Best Management Practice to be consistent with ongoing efforts across the Hanford Site. Three tables in the report summarize the DOE order applicability by the compliance categories, with a table for Level A, Level B, and Level C applicability. The attachment to the report documents the compliance applicability assessment for each individual DOE Order.

777 (WHC-SD-L045H-RRR-001-Rev.1) Readiness plan, Hanford 300 Area Treated Effluent Disposal Facility: Revision 1. Storm, S.J. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003775. Source: OSTI; NTIS; INIS; GPO Dep.

The 300 Area Treated Effluent Disposal Facility (TEDF) is designed for the collection, treatment, and eventual disposal of liquid waste from the 300 Area Process Sewer (PS) system. The PS currently discharges water to the 300 Area Process Trenches. Facilities supported total 54 buildings, including site laboratories, inactive buildings, and support facilities. Effluent discharges to the process sewer from within these facilities include heating, ventilation, and air conditioning systems, heat exchangers, floor drains, sinks, and process equipment. The wastewaters go through treatment processes that include iron coprecipitation, ion exchange and ultraviolet oxidation. The iron coprecipitation process is designed to remove general heavy metals. A series of gravity filters then complete the clarification process by removing suspended solids. Following the iron coprecipitation process is the ion exchange process, where a specific resin is utilized for the removal of mercury. The final main unit operation is the ultraviolet destruction process, which uses high power ultraviolet light and hydrogen peroxide to destroy organic molecules. The objective of this readiness plan is to provide the method by which line management will prepare for a Readiness Assessment (RA) of the TEDF. The self-assessment and RA will assess safety, health, environmental compliance and management readiness of the TEDF. This assessment will provide assurances to both WHC and DOE that the facility is ready to start-up and begin operation.

778 (WHC-SD-L045H-SM-001) 300 Area treated effluent disposal facility sampling schedule. Loll, C.M. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003243. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the interface between the 300 Area Liquid Effluent Process Engineering (LEPE) group and the Waste Sampling and Characterization Facility (WSCF), concerning process control samples. It contains a schedule for process control samples at the 300 Area TEDF which describes the parameters to be measured, the frequency of sampling and analysis, the sampling point, and the purpose for each parameter.

779 (WHC-SD-L045H-SM-001-Rev.1) 300 Area treated effluent disposal facility sampling schedule. Revision 1. Loll, C.M. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010090. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the interface between the 300 Area liquid effluent process engineering (LEPE) group and the waste sampling and characterization facility (WSCF), concerning process control samples. It contains a schedule for process control samples at the 300 Area TEDF which describes the parameters to be measured, the frequency of sampling and analysis, the sampling point, and the purpose for each parameter.

780 (WHC-SD-L045H-TI-005) 300 Area Treated Effluent Disposal Facility essential material specifications basis. Hagerty, K.J. Westinghouse Hanford Co., Richland, WA (United States). 26 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003239. Source: OSTI; NTIS; INIS; GPO Dep.

The 300 area Treated Effluent Disposal Facility (TEDF) was designed and built to treat the waste water from the 300 area process sewer system. Several treatment technologies are employed to remove the trace quantities of contaminants in the stream including iron coprecipitation, clarification, filtration, ion exchange, and ultraviolet light/hydrogen peroxide oxidation of organics. The chemicals that will be utilized in the treatment process are hydrogen peroxide, sulfuric acid, sodium hydroxide, and ferric chloride and are designated "Essential Materials" by facility management, as they are essential to the continuity of operations. This letter documents the required chemical characteristics and permissible contaminant limits in the essential materials, as well as the criteria that were used to establish these limits. Essential Material Specifications (EMS) will be generated from this information.

781 (WHC-SD-L070-PMP-001) Project L-070, "300 Area process sewer piping system upgrade" Project Management Plan. Wellsfry, H.E. Westinghouse Hanford Co., Richland, WA (United States). 16 Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001040. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the project management plan for Project L-070, 300 Area process sewer system upgrades.

782 (WHC-SD-L116-CDR-001) Conceptual design report, 200 Area sanitary sewer system: Project 96L-EWL-116. Pursley, D.L. (ICF Kaiser Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 26 Sep 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003329. Source: OSTI; NTIS; INIS; GPO Dep.

Project L-116 will install an integrated sanitary sewer system in the 200 Area. This new system will connect existing sewer systems for facilities that have a foreseeable future, provide capacity and routing for future facilities, and install new septic sewer systems for existing facilities that cannot be feasibly connected to the new sewer system and have a mission that will extend beyond the year 2000. Project L-116 will construct a sanitary sewer collection, treatment, and disposal system for facilities in the 200-East and -West Areas and adjacent areas located on the 200 Area plateau. The existing septic systems will be abandoned or decommissioned in accordance with applicable Washington State and local codes and regulations. The conceptual design for the sanitary sewer system is designed around population forecasts of 5,000 people for 200-West Area and 9,000 people

for 200-East Area. The definitive design will be based on the latest forecast populations at the time definitive design is initiated.

783 (WHC-SD-LEF-CSCM-001) Computer software configuration management plan for 200 East/West Liquid Effluent Facilities. Graf, F.A. Jr. Westinghouse Hanford Co., Richland, WA (United States). 27 Feb 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008500. Source: OSTI; NTIS; INIS; GPO Dep.

This computer software management configuration plan covers the control of the software for the monitor and control system that operates the Effluent Treatment Facility and its associated truck load in station and some key aspects of the Liquid Effluent Retention Facility that stores condensate to be processed. Also controlled is the Treated Effluent Disposal System's pumping stations and monitors waste generator flows in this system as well as the Phase Two Effluent Collection System.

784 (WHC-SD-LEF-OTR-001) 200 Area treated effluent disposal facility operational test report. Crane, A.F. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 184p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008801. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports the results of the 200 Area Treated Effluent Disposal Facility (200 Area TEDF) operational testing activities. These completed operational testing activities demonstrated the functional, operational and design requirements of the 200 Area TEDF have been met.

785 (WHC-SD-LEF-PLN-001) 300 Area Treated Effluent Disposal Facility permit reopener run plan. Olander, A.R. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009143. Source: OSTI; NTIS; INIS; GPO Dep.

The 300 Area Treated Effluent Disposal Facility (TEDF) is authorized to discharge treated effluent to the Columbia River by National Pollutant Discharge Elimination System permit WA-002591-7. The letter accompanying the final permit noted the following: EPA recognizes that the TEDF is a new waste treatment facility for which full scale operation and effluent data has not been generated. The permit being issued by EPA contains discharge limits that are intended to force DOE's treatment technology to the limit of its capability." Because of the excessively tight limits the permit contains a reopener clause which may allow limits to be renegotiated after at least one year of operation. The restrictions for reopening the permit are as follows: (1) The permittee has properly operated and maintained the TEDF for a sufficient period to stabilize treatment plant operations, but has nevertheless been unable to achieve the limitation specified in the permit. (2) Effluent data submitted by the permittee supports the effluent limitation modification(s). (3) The permittee has submitted a formal request for the effluent limitation modification(s) to the Director. The purpose of this document is to guide plant operations for approximately one year to ensure appropriate data is collected for reopener negotiations.

786 (WHC-SD-LEF-PLN-002) 200 area TEDF sample schedule. Brown, M.J. Westinghouse Hanford Co., Richland, WA (United States). 22 Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95010039. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the sampling criteria associated with the 200 Area Treatment Effluent Facility (TEDF) that are needed to comply with the requirements of the Washington State Discharge Permit No. WA ST 4502 and good engineering practices at the generator streams that feed into TEDF. In addition, this document identifies the responsible parties for both sampling and data transference.

787 (WHC-SD-LEF-QAPP-001) 200 Area Liquid Effluent Facilities - Quality assurance program plan. Fernandez, L. Westinghouse Hanford Co., Richland, WA (United States). 13 Mar 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009157. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan (QAPP) describes the quality assurance and management controls used by the 200 Area Liquid Effluent Facilities (LEF) to perform its activities in accordance with DOE Order 5700.6C. The 200 Area LEF consists of the following facilities: Effluent Treatment Facility (ETF); Treated Effluent Disposal Facility (TEDF); Liquid Effluent Retention facility (LERF); and Truck Loading Facility - (Project W291). The intent is to ensure that all activities such as collection of effluents, treatment, concentration of secondary wastes, verification, sampling and disposal of treated effluents and solids related with the LEF operations, conform to established requirements.

788 (WHC-SD-LEF-QAPP-002) 200 Area Treated Effluent Disposal Facility Quality Assurance Project Plan. Jungfleisch, F.M. Westinghouse Hanford Co., Richland, WA (United States). 24 Mar 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010149. Source: OSTI; NTIS; INIS; GPO Dep.

The project plan provides for the quality assurance of the 200 Area Treated Effluent Disposal Facility consistent with the Washington State Department of Ecology discharge monitoring permit. DQOs (data quality objective) support permit standards for data quality and quantity. Reference is made to groundwater monitoring, laboratory analyses, and data validation that are performed under related quality programs.

789 (WHC-SD-LEF-TS-001) 200 Area treated effluent disposal facility operational test specification. Crane, A.F. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005462. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the test specification and test requirements for the 200 Area Treated Effluent Disposal Facility (200 Area TEDF) operational testing activities. These operational testing activities, when completed, demonstrate the functional, operational and design requirements of the 200 Area TEDF have been met.

790 (WHC-SD-LEF-TS-001-Rev.1) 200 Area treated effluent disposal facility operational test specification. Crane, A.F. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007226. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the test specification and test requirements for the 200 Area Treated Effluent Disposal Facility (200 Area TEDF) operational testing activities. These operational testing activities, when completed, demonstrate the functional, operational and design requirements of the 200 Area TEDF have been met.

791 (WHC-SD-LEF-TS-001-Rev.2) 200 Area Treated Effluent Disposal Facility operational test specification. Revision 2. Crane, A.F. Westinghouse Hanford Co., Richland, WA (United States). 9 Feb 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007794. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the test specification and test requirements for the 200 Area Treated Effluent Disposal Facility (200 Area TEDF) operational testing activities. These operational testing activities, when completed, demonstrate the functional, operational and design requirements of the 200 Area TEDF have been met. The technical requirements for operational testing of the 200 Area TEDF are defined by the test requirements presented in Appendix A. These test requirements demonstrate the following: pump station No.1 and associated support equipment operate both automatically and manually; pump station No. 2 and associated support equipment operate both automatically and manually; water is transported through the collection and transfer lines to the disposal ponds with no detectable leakage; the disposal ponds accept flow from the transfer lines with all support equipment operating as designed; and the control systems operate and status the 200 Area TEDF including monitoring of appropriate generator discharge parameters.

792 (WHC-SD-SNF-ES-005) Options for disposition of KE-basin water. Morford, R.J. Westinghouse Hanford Co., Richland, WA (United States). 27 Oct 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003061. Source: OSTI; NTIS; INIS; GPO Dep.

This study is an options study for the disposition of the water in the K-East Basin. Several options are discussed, along with cost and schedule associated with each.

793 (WHC-SD-SNF-HC-002) Hazard categorization of 100K east and 100K west in-basin fuel characterization program activities. Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005295. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the determination that the in-basin activities at 105 K East (KE) and 105 K West (KW) on the Hanford Reservation associated with the fuel characterization program are classified as Hazard Category 3 (hazard analysis shows the potential for only significant localized consequences). Potential accident consequences, a description of significant activities around the site, and hazard identification and management were explored.

794 (WHC-SD-SQA-CSWD-30016) Verification and validation of DEPOSITION 2.0. Eadie, W.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001599. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to verify and validate the usage of the computer program, DEPOSITION 2.0 for use in assessing line loss in CAM and fixed head lines throughout

certain Hanford Site facilities. The scope of use is limited to this function. DEPOSITION 2.0 is the second version of this code to be used on the Hanford Site, the program now incorporates additional user-friendly features beyond those which were available in an earlier version, DEPOSITION 1.03.

795 (WHC-SD-TP-RPT-014) Progress report for the enhancement of Radcalc: Isotope database, gamma absorption fractions, and $G(H_2)$ values. Green, J.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001546. Source: OSTI; NTIS; INIS; GPO Dep.

Radcalc is a spreadsheet currently used to calculate the generation of hydrogen gas in low-level radioactive waste containers for purposes of transportation and packaging. Radcalc is being enlarged and expanded. It will be offered as a Windows compatible software and will include some of the following enhancements: extended radionuclide library, updated gamma absorption fractions for an increased number of packages, inclusion of a $G(H_2)$ value data base, updated transportation information, thermal and pressure calculation update, testing and benchmarking. This report discusses the progress made on the new Radcalc program. It presents the new radionuclide library, the results of the gamma absorption fractions for the increased number of packages, and an extensive review of $G(H_2)$ values.

796 (WHC-SD-W007H-ATP-001) BCP selector valves and limit switches. Rippy, G.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002085. Source: OSTI; NTIS; GPO Dep.

This document contains information about the Acceptance Test Procedure to demonstrate that the electrical/instrumentation systems for the BCP stream function as required by project criteria. Topics discussed include: References to engineering drawings and specifications; responsibilities of the project engineer, test director, records recorder, test operator, design engineer, and project manager; occupational safety and health; test performance; and what to do with exceptions.

797 (WHC-SD-W007H-ATP-002) BCE selector valves and flow proportional sampler. Rippy, G.L. Rochester Univ., NY (United States). Dept. of Radiation Therapy. 30 Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002086. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Electrical/Instrumentation systems for the BCE function as required by project criteria.

798 (WHC-SD-W007H-ATR-001) BCP selector valves and limit switches. Rippy, G.L. Westinghouse Hanford Co., Richland, WA (United States). 9 Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005650. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Electrical/Instrumentation systems for the BCP stream function as required by project criteria. Specifically, the test will verify the operation of the solenoid valves and associated limit switches installed for the BCP portion of W-007H. This equipment is part of the B-Plant Process Condensate Treatment Facility.

799 (WHC-SD-W007H-ATR-002) BCE selector valves and flow proportional sampler. Rippy, G.L. Westinghouse Hanford Co., Richland, WA (United States). 11 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005603. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Electrical/Instrumentation systems for the B-Plant Process Condensate Treatment Facility (BCE) function as required by project criteria. Tests will be run to: Verify the operation of the solenoid valve and associated limit switches installed for the BCE portion of W-007H; Operate the solenoid valve and verify the proper operation of the associated limit switches based on the position of the solenoid valve; and, Demonstrate the integrity of the Sample Failure Alarm Relay XFA-211BA-BCE-1, and Power Failure ALarm Relay JFA-211BA-BCE-1 located inside the Flow Proportional Sampler in Building 211 BA.

800 (WHC-SD-W007H-FDC-001-Rev.3) W-007H B Plant Process Condensate Treatment Facility. Revision 3. Rippy, G.L. Westinghouse Hanford Co., Richland, WA (United States). 20 Jan 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006595. Source: OSTI; NTIS; INIS; GPO Dep.

B Plant Process Condensate (BCP) liquid effluent stream is the condensed vapors originating from the operation of the B Plant low-level liquid waste concentration system. In the past, the BCP stream was discharged into the soil column under a compliance plan which expired January 1, 1987. Currently, the BCP stream is inactive, awaiting restart of the E-23-3 Concentrator. B Plant Steam Condensate (BCS) liquid effluent stream is the spent steam condensate used to supply heat to the E-23-3 Concentrator. The tube bundles in the E-23-3 Concentrator discharge to the BCS. In the past, the BCS stream was discharged into the soil column. Currently, the BCS stream is inactive. This project shall provide liquid effluent systems (BCP/BCS/BCE) capable of operating for a minimum of 20 years, which does not include the anticipated decontamination and decommissioning (D and D) period.

801 (WHC-SD-W007H-OTP-001) Operability test procedure for the TK-900 beta/gamma liquid effluent monitoring system. Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Feb 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008420. Source: OSTI; NTIS; INIS; GPO Dep.

This operability test procedure will verify that the 221-B beta/gamma liquid effluent monitoring system, installed near the east end of the six inch chemical sewer header, functions as intended by design. An off-line, skid mounted, beta/gamma radiation monitor and pH monitor was installed near stairwell three in the 221-B electrical gallery by Project W-007H. The skid mounted monitoring system includes two radiation detectors and a pH meter, both with local digital displays. Output signals from each monitor are also received and displayed by the Facility Process Monitor and Control System (FPMCS). Pumps, motors, gauges, valves and transport lines complement the skid monitoring system. The system is part of BAT/AKART for the BCE liquid effluent system.

802 (WHC-SD-W025-ATP-002) Acceptance test procedure: RMW Land Disposal Facility Project W-025.

Roscha, V. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Golder Associates, Inc., Redmond, WA (United States). 12 Dec 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005680. Source: OSTI; NTIS; INIS; GPO Dep.

This ATP establishes field testing procedures to demonstrate that the electrical/instrumentation system functions as intended by design for the Radioactive Mixed Waste Land Disposal Facility. Procedures are outlined for the field testing of the following: electrical heat trace system; transducers and meter/controllers; pumps; leachate storage tank; and building power and lighting.

803 (WHC-SD-W025-ATR-002) W-025, Acceptance Test Report. Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005234. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) has been prepared to establish field testing procedures to demonstrate that the Electrical/Instrumentation systems function as intended by the design.

804 (WHC-SD-W025-EMS-002) Weight/balance portable test equipment. Whitlock, R.W. Westinghouse Hanford Co., Richland, WA (United States). 3 Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003846. Source: OSTI; NTIS; INIS; GPO Dep.

This document shows the general layout, and gives a part description for the weight/balance test equipment. This equipment will aid in the regulation of the leachate loading of tanker trucks. The report contains four drawings with part specifications. The leachate originates from lined trenches.

805 (WHC-SD-W025-EMS-002-Rev.1) Weight/balance portable test equipment. Whitlock, R.W. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004471. Source: OSTI; NTIS; INIS; GPO Dep.

This document shows the general layout, and gives a part description for the Weight/Balance Test Equipment.

806 (WHC-SD-W025-FDR-001-Rev.1-Vol.1-2) Definitive design report: Design report project W-025, Radioactive Mixed Waste (RMW) Land Disposal Facility NON-Drag-Off. Revision 1, Volume 1 and 2. Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 29 Nov 1994. 431p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004403. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to describe the definitive design of the Radioactive Mixed Waste (RMW) Non-Drag-Off disposal facility, Project W-025. This report presents a n of the major landfill design features and a discussion of how each of the criteria is addressed in the design. The appendices include laboratory test results, design drawings, and individual analyses that were conducted in support of the design. Revision 1 of this document incorporates design changes resulting from an increase in the required operating life of the W-025 landfill from 2 to 20 years. The rationale for these design changes is described in Golder Associates Inc. 1991a. These changes include (1) adding a 1.5-foot-thick layer of compacted admix directly under the primary FML

on the floor of the landfill to mitigate the effects of possible stress cracking in the primary flexible membrane liner (FML), and (2) increasing the operations layer thickness from two to three feet over the entire landfill area, to provide additional protection for the secondary admix layer against mechanical damage and the effects of freezing and desiccation. The design of the W-025 Landfill has also been modified in response to the results of the EPA Method 9090 chemical compatibility testing program (Golder Associates Inc. 1991b and 1991c), which was completed after the original design was prepared. This program consisted of testing geosynthetic materials and soil/bentonite admix with synthetic leachate having the composition expected during the life of the W-025 Landfill. The results of this program indicated that the polyester geotextile originally specified for the landfill might be susceptible to deterioration. On this basis, polypropylene geotextiles were substituted as a more chemically-resistant alternative. In addition, the percentage of bentonite in the admix was increased to provide sufficiently low permeability to the expected leachate.

807 (WHC-SD-W025-PLN-002) Readiness assessment plan for the Radioactive Mixed Waste Land Disposal Facility (Trench 31). Irons, L.G. Westinghouse Hanford Co., Richland, WA (United States). 22 Nov 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003306. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the Readiness Assessment Plan (RAP) for the Project W-025 (Radioactive Mixed Waste Land Disposal Facility) Readiness Assessment (RA). The RAP documents prerequisites to be met by the operating organization prior to the RA. The RAP is to be implemented by the RA Team identified in the RAP. The RA Team is to verify the facility's compliance with criteria identified in the RAP. The criteria are based upon the "Core Requirements" listed in DOE Order 5480.31, "Startup and Restart of Nuclear Facilities".

808 (WHC-SD-W025-RPT-001) Construction quality assurance report. Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1994. 954p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-89RL11615. Order Number DE95005935. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the construction quality assurance (CQA) observation and test results, including: The results of the geosynthetic and soil materials conformance testing. The observation and testing results associated with the installation of the soil liners. The observation and testing results associated with the installation of the HDPE geomembrane liner systems. The observation and testing results associated with the installation of the leachate collection and removal systems. The observation and testing results associated with the installation of the working surfaces. The observation and testing results associated with in-plant manufacturing process. Summary of submittal reviews by Golder Construction Services, Inc. The submittal and certification of the piping material specifications. The observation and verification associated of the Acceptance Test Procedure results of the operational equipment functions. Summary of the ECNs which are incorporated into the project.

809 (WHC-SD-W025-RPT-002) Construction quality assurance report Radioactive Mixed Waste Land Disposal Facility Non-Drag-Off-2, Project No. W-025,

Second Landfill, Hanford Site, Richland, Washington. Roscha, V. (Golder Construction Services, Inc., Redmond, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Golder Construction Services, Inc., Redmond, WA (United States). 22 Feb 1995. 790p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010703. Source: OSTI; NTIS; INIS; GPO Dep.

Quality assurance observation and testing were performed for the construction of the Radioactive Mixed Waste Land Disposal Facility located in the 200 West Area of the Hanford Reservation. This report provides a summary of the results, including results of the geosynthetic and soil materials conformance testing; installation of the soil liners, HDPE geomembrane liner systems, leachate collection and removal systems, and working surfaces; and the acceptance test procedures for the electrical and mechanical components of the leachate collection and removal systems.

810 (WHC-SD-W025-RPT-003) Interim safety basis compliance matrix for Trenches 31 and 34. Ames, R.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005137. Source: OSTI; NTIS; INIS; GPO Dep.

The tables provided in this document identify the specific requirements and basis for the administrative controls established in the Westinghouse Hanford Company (WHC) Solid Waste Burial Ground (SWBG) Interim Safety Basis (ISB) for operation of the Project W-025, Mixed Waste Lined Landfill (Trenches 31 and 34). The tables document the necessary controls and implementing procedures to ensure compliance with the requirements of the ISB. These requirements provide a basis for future Unreviewed Safety Questions (USQ) screening of applicable procedure changes, proposed physical modifications, tests, experiments, and occurrences. Table 1 provides the SWBG interim Operational Safety Requirements administrative controls matrix. The specific assumptions and commitments used in the safety analysis documents applicable to disposal of mixed wastes in Trenches 31 and 34 are provided in Table 2. Table 3 is provided to document the potential engineered and administrative mitigating features identified in the Preliminary Hazard Analysis (PHA) for disposal of mixed waste.

811 (WHC-SD-W025-VI-001) Leachate storage transport tanker loadout piping. Whitlock, R.W. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002083. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains schematic drawings for the pipe fittings for the Hanford waste tanks. Included are the modifications to the W-025 trench #31 leachate loadout piping, and also the modifications to the tanker trailers. The piping was modified to prevent spillage to the environment. The tankers were modified for loading and unloading purposes.

812 (WHC-SD-W025-VI-001-Rev.1) Leachate storage transport tanker loadout piping. Whitlock, R.W. Westinghouse Hanford Co., Richland, WA (United States). 18 Nov 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004158. Source: OSTI; NTIS; INIS; GPO Dep.

This report shows the modifications to the W-025 Trench No. 31 leachate loadout discharge piping, and also the

steps involved in installing the discharge piping, including dimensions and welding information. The installation of the discharge pipe should be done in accordance to current pipe installation standards. Trench No. 31 is a radioactive mixed waste land disposal facility.

813 (WHC-SD-W026-PLN-004) Implementation plan for WRAP Module 1 operational readiness review. Irons, L.G. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003844. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Receiving and Processing Module 1 (WRAP 1) will be used to receive, sample, treat, and ship contact-handled (CH) transuranic (TRU), low-level waste (LLW), and low-level mixed waste (LLMW) to storage and disposal sites both on the Hanford site and off-site. The primary mission of WRAP 1 is to characterize and certify CH waste in 55-gallon and 85-gallon drums; and its secondary function is to certify CH waste standard waste boxes (SWB) and boxes of similar size for disposal. The WRAP 1 will provide the capability for examination (including x-ray, visual, and contents sampling), limited treatment, repackaging, and certification of CH suspect-TRU waste in 55-gallon drums retrieved from storage, as well as newly generated CH LLW and CH TRU waste drums. The WRAP 1 will also provide examination (X-ray and visual only) and certification of CH LLW and CH TRU waste in small boxes. The decision to perform an Operational Readiness Review (ORR) was made in accordance with WHC-CM-5-34, Solid Waste Disposal Operations Administration, Section 1.4, Operational Readiness Activities. The ORR will ensure plant and equipment readiness, management and personnel readiness, and management programs readiness for the initial startup of the facility. This implementation plan is provided for defining the conduct of the WHC ORR.

814 (WHC-SD-W026-PLN-005) WRAP Module 1 waste characterization plan. Mayancsik, B.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006886. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to present the characterization methodology for waste generated, processed, or otherwise the responsibility of the Waste Receiving and Processing (WRAP) Module 1 facility. The scope of this document includes all solid low level waste (LLW), transuranic (TRU), mixed waste (MW), and dangerous waste. This document is not meant to be all-inclusive of the waste processed or generated within WRAP Module 1, but to present a methodology for characterization. As other streams are identified, the method of characterization will be consistent with the other streams identified in this plan. The WRAP Module 1 facility is located in the 200 West Area of the Hanford Site. The facility's function is two-fold. The first is to verify/characterize, treat and repackage contact handled (CH) waste currently in retrievable storage in the LLW Burial Grounds, Hanford Central Waste Complex, and the Transuranic Storage and Assay Facility (TRUSAF). The second is to verify newly generated CH TRU waste and LLW, including MW. The WRAP Module 1 facility provides NDE and NDA of the waste for both drums and boxes. The NDE is used to identify the physical contents of the waste containers to support waste characterization and processing,

verification, or certification. The NDA results determine the radioactive content and distribution of the waste.

815 (WHC-SD-W026-PLN-006) **WRAP Module 1 sampling and analysis plan.** Mayancsik, B.A. Westinghouse Hanford Co., Richland, WA (United States). 24 Mar 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010148. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the methodology to sample, screen, and analyze waste generated, processed, or otherwise the responsibility of the Waste Receiving and Processing Module 1 facility. This includes Low-Level Waste, Transuranic Waste, Mixed Waste, and Dangerous Waste.

816 (WHC-SD-W026-QAPP-001-Rev.1) **Quality Assurance Project Plan, W-026. Revision 1.** McGee, J.R. Westinghouse Hanford Co., Richland, WA (United States). 4 Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010105. Source: OSTI; NTIS; INIS; GPO Dep.

This project will provide a facility in which retrieved and newly generated 55-gallon drums and 83-gallon overpacked drums of contact handled solid radioactive waste are inspected, assayed, and drums opened if necessary. Waste contents will be sorted and segregated if necessary, empty drums and waste compacted, repackaged, certified, and shipped to final disposal. Small newly generated boxes will be similarly treated. (Boxes will not be opened in WRAP Module 1, but in a later WRAP Module.) This document describes the Quality Assurance Program to be followed during the definitive design phase and various stages of construction.

817 (WHC-SD-W026-TC-002) **Test procedure for boxed waste assay system.** Wachter, J. (Los Alamos National Lab., NM (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos National Lab., NM (United States). 7 Dec 1994. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004981. Source: OSTI; NTIS; INIS; GPO Dep.

This document, prepared by Los Alamos National Laboratory's NMT-4 group, details the test methodology and requirements for Acceptance/Qualification testing of a Boxed Waste Assay System (BWAS) designed and constructed by Pajarito Scientific Corporation. Testing of the BWAS at the Plutonium Facility (TA55) at Los Alamos National Laboratory will be performed to ascertain system adherence to procurement specification requirements. The test program shall include demonstration of conveyor handling capabilities, gamma ray energy analysis, and imaging passive/active neutron accuracy and sensitivity. Integral to these functions is the system's embedded operating and data reduction software.

818 (WHC-SD-W026-TP-001) **Nondestructive examination development and demonstration plan.** Weber, J.R. Westinghouse Hanford Co., Richland, WA (United States). 21 Aug 1991. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001981. Source: OSTI; NTIS; INIS; GPO Dep.

Nondestructive examination (NDE) of waste matrices using penetrating radiation is by nature very subjective. Two candidate systems of examination have been identified for use in WRAP 1. This test plan describes a method for a

comparative evaluation of different x-ray examination systems and techniques.

819 (WHC-SD-W026-TP-008) **Aerosol can puncture device operational test plan.** Leist, K.J. Westinghouse Hanford Co., Richland, WA (United States). 3 May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001842. Source: OSTI; NTIS; INIS; GPO Dep.

Puncturing of aerosol cans is performed in the Waste Receiving and Processing Facility Module 1 (WRAP 1) process as a requirement of the waste disposal acceptance criteria for both transuranic (TRU) waste and low-level waste (LLW). These cans have contained such things as paints, lubricating oils, paint removers, insecticides, and cleaning supplies which were used in radioactive facilities. Due to Westinghouse Hanford Company (WHC) Fire Protection concerns of the baseline system's fire/explosion proof characteristics, a study was undertaken to compare the baseline system's design to commercially available puncturing devices. While the study found no areas which might indicate a risk of fire or explosion, WHC Fire Protection determined that the puncturing system must have a demonstrated record of safe operation. This could be obtained either by testing the baseline design by an independent laboratory, or by substituting a commercially available device. As a result of these efforts, the commercially available Aerosolv can puncturing device was chosen to replace the baseline design. Two concerns were raised with the system. Premature blinding of the coalescing/carbon filter, due to its proximity to the puncture and draining operation; and overpressurization of the collection bottle due to its small volume and by blinding of the filter assembly. As a result of these concerns, testing was deemed necessary. The objective of this report is to outline test procedures for the Aerosolv.

820 (WHC-SD-W100-AP-002) **183-H basin sludge treatability testing program plan.** Burbank, D.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002113. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the scope, data objectives, plan of action, responsibilities, cost and schedule of a program to perform hot treatability testing on 183-H basin sludge samples. This plan is the top-level planning document for this activity.

821 (WHC-SD-W100-DTR-003) **Waste receiving and processing module 2A mixing tests status report.** Weber, J.R.; Hull, K.J. Westinghouse Hanford Co., Richland, WA (United States). 18 Nov 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004418. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to document the Phase II test conditions, observations, and results of this work. This report provides additional mixing performance test data and rheologic data that provide further indications that there are clear and distinct advantages in the preliminary choice of high-shear mixing alone, and high-shear dispersion in combination with, or followed by, a low-speed type mixer/stirrer for WRAP 2A facility design. Another objective was to determine if significant scale-up problems might exist in the various mix and mixer designs. In the later Phase 2 tests the test material quantities were significantly larger than in the Phase 1 tests.

822 (WHC-SD-W100-ES-009) Application of DOE prescribed guides to the evaluation of Hanford's Mixed Low Level Solid Waste Treatment Options. Campbell, B.F.; Nash, C.R. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004103. Source: OSTI; NTIS; INIS; GPO Dep.

A recent Westinghouse Hanford Company report (WHC-SD-W100-ES-008, February, 1994), compared a Vitrification process to the WRAP-2A Grout/PE process for the treatment of Mixed Low Level Waste (MLLW). This comparison applied a limited scope numerical evaluation to compare technology complexity of the two processes, but focused primarily on capital and operating costs. The work reported here is supplementary to WHC-SD-W100-ES-008. It provides a record of the application of the more formal DOE-prescribed criteria (Treatment Selection Guides for Federal Facility Compliance Act Draft Site Treatment Plans) to the Vitrification and Grout/PE processes previously evaluated. Results of the evaluation favored the Grout/PE process by a weighted score of 83 to 78 over the Plasma arc vitrification process.

823 (WHC-SD-W100-RD-001-Rev.1) Waste Receiving and Processing, Module 2A, feed specification: Revision 1. Kruger, O.L.; Sheriff, M.L. Westinghouse Hanford Co., Richland, WA (United States). 14 Nov 1994. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003782. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed descriptions of the various mixed low-level waste feed streams that will be processed in the Waste Receiving and Processing Facility, Module 2A (WRAP 2A) are provided. Feed stream descriptions are based on available reports, the solid waste information tracking system database, and the 1993 solid waste forecast data. Available chemical and physical attributes, radionuclide data, waste codes, and packaging information are shown for 15 feed streams. The information sources and methodology for obtaining projections for WRAP 2A expected feed stream volumes also are described.

824 (WHC-SD-W100-SDRD-001) Waste Receiving and Packaging, Module 2A, Supplemental Design Requirements Document. Lamberd, D.L.; Boothe, G.F.; Hinkle, A.L.; Horgos, R.M.; LeClair, M.D.; Nash, C.R.; Ocampo, V.P.; Pauly, T.R.; Stroup, J.L.; Weingardt, K.M. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001839. Source: OSTI; NTIS; INIS; GPO Dep.

The Supplemental Design Requirements Document (SDRD) is used to communicate plant design information from Westinghouse Hanford Company (WHC) to the US Department of Energy (DOE) and the cognizant Architect Engineer (A/E). Information in the SDRD serves two purposes: to convey design requirements that are too detailed for inclusion in a Functional Design Criteria (FDC) report; and to serve as a means of change control for design commitments in the Conceptual Design Report. The mission of WRAP 2A on the Hanford site is the treatment of contact handled low level mixed waste (MW) for final disposal. The overall systems engineering steps used to reach construction and operation of WRAP 2A are depicted in Figure 1. The WRAP 2A SDRD focuses on the requirements to address the functional analysis provided in Figure 1. This information is provided in sections 2 through 5 of this SDRD.

The mission analysis and functional analysis are to be provided in a separate supporting document. The organization of sections 2 through 5 corresponds to the requirements identified in the WRAP 2A functional analysis.

825 (WHC-SD-W100-TC-001) Test procedures for WRAP 2A treatability study. Biyani, R.K. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003066. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes operating procedures to prepare and test cementitious specimens designed to immobilize 183-H basin waste.

826 (WHC-SD-W100-TD-001) 183-H Basin Mixed Waste Analysis and Testing Report. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010088. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this sampling and analysis report is to provide data necessary to support treatment and disposal options for the low-level mixed waste from the 183-H solar evaporation ponds. In 1973, four of the 16 flocculation and sedimentation basins were designated for use as solar evaporation basins to provide waste reduction by natural evaporation of liquid chemical wastes from the 300 Area fuel fabrication facilities. The primary purpose of this effort is to gather chemical and bulk property data for the waste in the drums/boxes of sediment removed from the basin at Central Waste Complex.

827 (WHC-SD-W100-TP-011) CEL Working procedures for WRAP 2A formulation development test. Duchsherer, M.J. Westinghouse Hanford Co., Richland, WA (United States). 2 Aug 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001520. Source: OSTI; NTIS; INIS; GPO Dep.

The WRAP 2A facility will encapsulate retrieved, stored, and newly generated contact-handled mixed low level waste (MLLW) into 55-500 gal cementitious forms. Standardized test procedures will be required to facilitate this process. Cementitious specimens will be prepared from simulated drum wastes and will be tested in the Chemical Engineering Laboratory using the laboratory operating/working procedures incorporated into this document.

828 (WHC-SD-W100-TP-014) Phase III (full scale) agitated mixing test plan. Ruff, D.T. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002109. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Receiving and Processing Facility Module 2A (WRAP 2A) is the proposed second module of the WRAP facility. This facility will provide the required treatment for contact handled (CH) Low Level (LL) Mixed Waste (MW) to allow its permanent disposal. Solidification of a portion of this waste using a cement based grout has been selected in order to reduce the toxicity and mobility of the waste in the disposal site. Mixing of the waste with the cement paste and material handling constraints/requirements associated with the mixed material is, therefore, a key process in the overall treatment strategy. This test plan addresses Phase 3, Full Scale Testing. The objectives of these tests are to determine

if there are scale-up issues associated with the mixing results obtained in Phase 1 and 2 mixing tests, verify the workability of mixtures resulting from previous formulation development efforts (Waste Immobilization Development [WID]), and provide a baseline for WRAP 2A mixing equipment design. To this end, the following objectives are of particular interest: determine geometric influence of mixing blade at full scale (i.e., size, type, and location: height/offset); determine if similar results in terms of mixing effectiveness and product quality are achievable at this scale; determine if vibration is as effective at this larger scale in fluidizing the mixture and aiding in cleaning the vessel; determine if baffles or sweeping blades are needed to aid in mixing at the larger size and for cleaning the vessel; and determine quality of the poured monolithic product and investigate exotherm and filling influences at this larger size.

829 (WHC-SD-W112-CSER-001) Criticality classification of enhanced radioactive and mixed waste storage. Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010103. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to evaluate the criticality potential of the Enhanced Radioactive and Mixed Waste Storage Facility, Project W-112, and to demonstrate that the facility can be classified as a limited control facility in accordance with the requirements of the Nuclear Criticality Safety Manual, WHC-CM-42-9 (WHC 1994). This document also recommends reducing the extent of criticality safety training that operators in W-112 should receive and minimize the level of criticality safety design reviews and inspections commensurate with the type of activities engaged in the facility.

830 (WHC-SD-W112-ES-006) Solid waste management complex site development plan. Greager, T.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001600. Source: OSTI; NTIS; INIS; GPO Dep.

The main purpose of this Solid Waste Management Complex Site Development Plan is to optimize the location of future solid waste treatment and storage facilities and the infrastructure required to support them. An overall site plan is recommended. Further, a series of layouts are included that depict site conditions as facilities are constructed at the SWMC site. In this respect the report serves not only as the siting basis for future projects, but provides siting guidance for Project W-112, as well. The plan is intended to function as a template for expected growth of the site over the next 30 years so that future facilities and infrastructure will be properly integrated.

831 (WHC-SD-W112-SDRD-001) Supplemental design requirements document enhanced radioactive and mixed waste storage Phase V Project W-112. Ocampo, V.P.; Boothe, G.F.; Greager, T.M.; Johnson, K.D.; Kooiker, S.L.; Martin, J.D. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005050. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides additional and supplemental information to WHC-SD-W112-FDC-001, Project W-112 for radioactive and mixed waste storage. It provides additional requirements for the design and summarizes Westinghouse

Hanford Company key design guidance and establishes the technical baseline agreements to be used for definitive design of the Project W-112 facilities.

832 (WHC-SD-W113-SDRD-001) Supplemental design requirements document enhanced radioactive and mixed waste storage: Phase 5, Project W-113. Ocampo, V.P. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005066. Source: OSTI; NTIS; INIS; GPO Dep.

This Supplemental Design Requirements Document (SDRD) is used to communicate Project W-113 specific plant design information from Westinghouse Hanford Company (WHC) to the United States Department of Energy (DOE) and the cognizant Architect Engineer (A/E). The SDRD is prepared after the completion of the project Conceptual Design report (CDR) and prior to the initiation of definitive design. Information in the SDRD serves two purposes: to convey design requirements that are too detailed for inclusion in the Functional Design Criteria (FDC) report and to serve as a means of change control for design commitments in the Title I and Title II design. The Solid Waste Retrieval Project (W-113) SDRD has been restructured from the equipment based outline used in previous SDRDs to a functional systems outline. This was done to facilitate identification of deficiencies in the information provided in the initial draft SDRD and aid design confirmation. The format and content of this SDRD adhere as closely as practicable to the requirements of WHC-CM-6-1, Standard Engineering Practices for Functional Design Criteria.

833 (WHC-SD-W242-ES-003) Low level mixed waste thermal treatment technical basis report. Place, B.G. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003869. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed characterization of the existing and projected Hanford Site Radioactive Mixed Waste (RMW) inventory was initiated in 1993 (Place 1993). This report presents an analysis of the existing and projected RMW inventory. The subject characterization effort continues to be in support of the following engineering activities related to thermal treatment of Hanford Site RMW: (1) Contracting for commercial thermal treatment; (2) Installation and operation of an onsite thermal treatment facility (Project W-242); (3) Treatment at another Department of Energy (DOE) site. The collation of this characterization information (data) has emphasized the establishment of a common data base for the entire existing RMW inventory so that the specification of feed streams destined for different treatment facilities can be coordinated.

834 (WHC-SD-W306-SDRD-001) Supplemental design requirements document solid waste operations complex. Ocampo, V.P. (and others); Boothe, G.F.; Broz, D.R.; Eaton, H.E.; Greager, T.M.; Huckfeldt, R.A.; Kooiker, S.L.; Lamberd, D.L.; Lang, L.L.; Myers, J.B. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005229. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides additional and supplemental information to the WHC-SD-W112-FDC-001, WHC-SD-W113-FDC-001, and WHC-SD-W100-FDC-001. It provides additional requirements for the design and summarizes Westinghouse Hanford Company key design guidance and

establishes the technical baseline agreements to be used for definitive design common to the Solid Waste Operations Complex (SWOC) Facilities (Project W-112, Project W-113, and WRAP 2A).

835 (WHC-SD-W306-TI-003) Hazard control indices for radiological and non-radiological materials. Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005621. Source: OSTI; NTIS; INIS; GPO Dep.

This document devises a method of comparing radiological and non-radiological hazard control levels. Such a comparison will be useful in determining the design control features for facilities that handle radioactive mixed waste. The design control features of interest are those that assure the protection of workers and the environment from unsafe airborne levels of radiological or non-radiological hazards.

836 (WHC-SD-W364-PMP-001) Project Management Plan (PMP), W-364, 209E septic system upgrade, 200 East Area. Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001308. Source: OSTI; NTIS; INIS; GPO Dep.

The document is the Project Management Plan (PMP) of the design and installation of the 209E Septic System Upgrade.

837 (WHC-SD-W370-ER-001) Recommendation for sanitary waste water system replacement, 222-S. Simmons, F.M. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003863. Source: OSTI; NTIS; INIS; GPO Dep.

The 2607-W6 septic system is not approved by the Washington State Department of Health. The system is over 40 years old and is operating at greater than 200% capacity. Under these conditions the system is subject to imminent failure and is not adequately treating the septic waste. This poses a potential personnel health risk. It is recommended that this system be upgraded by installation of a new drain field similar to the modification of the 2607-W1 system.

838 (WHC-SD-W370-FDC-001) 2607-W6 sanitary drainfield replacement. Simmons, F.M. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003864. Source: OSTI; NTIS; INIS; GPO Dep.

The septic 2607-W6 which supports the 222-S complex is operating at 200% capacity. The septic tank has been inspected and found to be sound. Test hole excavations of the existing drainfield indicate that it is disposing of the current waste water effluent load as opposed to treating it. The system is over 40 years old and has not been approved by the Washington State Department of Health. Under the existing operating conditions it is subject to imminent failure. No additional tie-ins or increases in personnel are allowed which will increase the flow to the 2607-W6 system.

839 (WHC-SD-W378-ES-001) Low level tank waste disposal study. Mullally, J.A. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Albuquerque, NM (United States); British

Nuclear Fuels plc, Risley (United Kingdom); Southwest Research Inst., San Antonio, TX (United States); TRW, Inc., Redondo Beach, CA (United States). 29 Sep 1994. 379p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001532. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company (WHC) contracted a team consisting of Los Alamos Technical Associates (LATA), British Nuclear Fuel Laboratories (BNFL), Southwest Research Institute (SwRI), and TRW through the Tank Waste Remediation System (TWRS) Technical Support Contract to conduct a study on several areas concerning vitrification and disposal of low-level-waste (LLW). The purpose of the study was to investigate how several parameters could be specified to achieve full compliance with regulations. The most restrictive regulation governing this disposal activity is the National Primary Drinking Water Act which sets the limits of exposure to 4 mrem per year for a person drinking two liters of ground water daily. To fully comply, this constraint would be met independently of the passage of time. In addition, another key factor in the investigation was the capability to retrieve the disposed waste during the first 50 years as specified in Department of Energy (DOE) Order 5820.2A. The objective of the project was to develop a strategy for effective long-term disposal of the low-level waste at the Hanford site.

840 (WHC-SD-W378-SP-001) Low-Level Waste Vitrification Plant Project contracting strategy decision analysis report. Felise, P.; Phillips, J.D. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002155. Source: OSTI; NTIS; INIS; GPO Dep.

Ten basic contracting strategies were developed after a review of past strategies that had been used at the Hanford Site, other US Department of Energy (DOE) sites, other US government agencies, and in the private sector. As applicable to the Low-Level Waste Vitrification Plant (LLWVP) Project, each strategy was described and depicted in a schedule format to assess compatibility with the Hanford Federal Facility Agreement and Consent Order, as well as known as the Tri-Party Agreement (Ecology et al. 1994) milestones, key decision points, and other project requirements. The pro and con aspects of each strategy also were tabulated. Using this information as a basis, the LLWVP Project team members, along with representatives of Tank Waste Remediation System (TWRS) Engineering, TWRS Programs, and Procurement Materials Management, formed a Westinghouse Hanford Company (WHC) evaluation team to select the best strategy. Kepner-Tregoe decision analysis techniques were used in facilitated meetings to arrive at the best balanced choice.

841 (WHC-SD-WM-AP-029) Boundary description for removal of water cooled chillers. Thompson, M.W. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003279. Source: OSTI; NTIS; INIS; GPO Dep.

This SD describes the boundaries for removal of the water cooled chillers by projects. In this paper, the author defines K Basins Engineering and project responsibilities for removal of the Trane.

842 (WHC-SD-WM-AP-033) Mixed waste trench loading placement instructions. Johnson, K.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005074. Source: OSTI; NTIS; INIS; GPO Dep.

This Document provides instruction for planning where to locate waste to be placed in the Mixed Waste trenches in the 218-W-5 Burial Ground in the 200 West Area.

843 (WHC-SD-WM-DTR-030) Metallic mercury recycling. Final report. Beck, M.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014630. Source: OSTI; NTIS; INIS; GPO Dep.

Metallic mercury is known to be a hazardous material and is regulated as such. The disposal of mercury, usually by landfill, is expensive and does not remove mercury from the environment. Results from the Metallic Mercury Recycling Project have demonstrated that metallic mercury is a good candidate for reclamation and recycling. Most of the potential contamination of mercury resides in the scum floating on the surface of the mercury. Pinhole filtration was demonstrated to be an inexpensive and easy way of removing residues from mercury. The analysis method is shown to be sufficient for present release practices, and should be sufficient for future release requirements. Data from tests are presented. The consistently higher level of activity of the filter residue versus the bulk mercury is discussed. Recommendations for the recycling procedure are made.

844 (WHC-SD-WM-EV-096) LLBG mixed waste disposal facility leachate sampling and analysis plan. Ambre, P.T. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006888. Source: OSTI; NTIS; INIS; GPO Dep.

Document addresses generator waste analysis requirements mandated by regulatory agencies and others for disposal of leachate from mixed waste landfills.

845 (WHC-SD-WM-FHA-006) Fire hazard analysis for the Westinghouse Hanford Company managed low-level mixed waste Trench 31 and 34. Howard, B.J. Westinghouse Hanford Co., Richland, WA (United States). 10 Jan 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005625. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis is to assess comprehensively the risks from fire within the new lined landfills, provided by W-025 and designated Trench 31 and 34 of Burial Ground 218-W-5; they are located in the 200 West area of the Hanford Site, and are designed to receive low-level mixed waste.

846 (WHC-SD-WM-ML-001) Hanford low-level vitrification melter testing - Master list of data submittals. Hendrickson, D.W. Westinghouse Hanford Co., Richland, WA (United States). 15 Mar 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009099. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company (WHC) is conducting a two-phased effort to evaluate melter system technologies for vitrification of liquid low-level radioactive waste (LLW) streams. The evaluation effort includes demonstration testing of selected glass melter technologies and

technical reports regarding the applicability of the glass melter technologies to the vitrification of Hanford LLW tank waste. The scope of this document is to identify and list vendor document submittals in technology demonstration support of the Hanford Low-Level Waste Vitrification melter testing program. The scope of this document is limited to those documents responsive to the Statement of Work, accepted and issued by the LLW Vitrification Program. The purpose of such a list is to maintain configuration control of vendor supplied data and to enable ready access to, and application of, vendor supplied data in the evaluation of melter technologies for the vitrification of Hanford low-level tank wastes.

847 (WHC-SD-WM-PICD-001) Liquid effluent services and solid waste disposal interface control document. Carlson, A.B. Westinghouse Hanford Co., Richland, WA (United States). 27 Oct 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003271. Source: OSTI; NTIS; INIS; GPO Dep.

This interface control document between Liquid Effluent Services (LES) and Solid Waste Disposal (SWD) establishes the functional responsibilities of each division where interfaces exist between the two divisions. The document includes waste volumes and timing for use in planning the proper waste management capabilities. The interface control document also facilitates integration of existing or planned waste management capabilities of the Liquid Effluent Services and Solid Waste divisions.

848 (WHC-SD-WM-PLN-071) 384 Power plant waste water sampling and analysis plan. Hagerty, K.J.; Knotek, H.M. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005142. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the 384 Power House Sampling and Analysis Plan. The Plan describes sampling methods, locations, frequency, analytes, and stream descriptions. The effluent streams from 384, were characterized in 1989, in support of the Stream Specific Report (WHC-EP-0342, Addendum 1).

849 (WHC-SD-WM-PLN-090) Low-level waste vitrification plant environmental permitting plan. Gretsinger, W.T.; Colby, J.M. Westinghouse Hanford Co., Richland, WA (United States). 3 Oct 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002369. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents projected environmental permitting and approval requirements for the treatment and disposal of low-level Hanford tank waste by vitrification. Applicability, current status, and strategy are discussed for each potential environmental permit or approval.

850 (WHC-SD-WM-PROC-014) KW basin backwash pit sludge measurement/video. Dodd, E.N. Jr. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010083. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this procedure is to gather visual and depth information and monitor underwater activities in the 105-KW SFBWP and transfer channel. Profile lighting (the use of lighting and shadows to show the surface contour)

will be used to assess the contour of the sludge surface. Select measurements will also be taken to determine the actual sludge depth. The control/video station will be setup outside the radiation area or in lowest possible exposure area to reduce personnel exposure (ALARA). This procedure is to provide a mechanism to assist in fully characterizing the volume and surface topology of the sludge currently deposited in the sandfilter backwash pit (SFBWP). Surveillance Systems Engineering (SSE) personnel will gather visual information utilizing a closed circuit television (CCTV) color camera, mounted to stainless steel extension poles. Connections allow the camera to be connected with a pan and tilt to allow better positioning capabilities and to get good landscape profiling of the sediment surface. The information will be videotaped to a one-half inch NTSC or Y/C format. Underwater lighting will be accomplished by means of 500 watt underwater lamps.

851 (WHC-SD-WM-RA-010) Qualitative risk assessment of subsurface barriers in applications supporting retrieval of SST waste. Treat, R.L. (ENSERCH Environmental Corp. (United States)). Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016466. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a brief, qualitative assessment of risks associated with the potential use of impermeable surface barriers installed around and beneath Hanford Site single-shell tanks (SSTs) to support the retrieval of wastes from those tanks. These risks are compared to qualitative assessment of costs and risks associated with a case in which barriers are not used. A quantitative assessment of costs and risks associated with these two cases will be prepared and documented in a companion report. The companion report will compare quantitatively the costs and risks of several retrieval options with varying parameters, such as effectiveness of retrieval, effectiveness of subsurface barriers, and the use of surface barriers. For ease of comparison of qualitative risks, a case in which impermeable subsurface barriers are used in conjunction with another technology to remove tank waste is referred, to in this report as the Barrier Case. A case in which waste removal technologies are used without employing a subsurface barrier is referred to as the No Barrier Case. The technologies associated with each case are described in the following sections.

852 (WHC-SD-WM-RD-052) Preliminary low-level waste feed definition guidance - LLW pretreatment interface. Shade, J.W.; Connor, J.M.; Hendrickson, D.W.; Powell, W.J.; Watrous, R.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008409. Source: OSTI; NTIS; INIS; GPO Dep.

The document describes limits for key constituents in the LLW feed, and the bases for these limits. The potential variability in the stream is then estimated and compared to the limits. Approaches for accommodating uncertainty in feed inventory, processing strategies, and process design (melter and disposal system) are discussed. Finally, regulatory constraints are briefly addressed.

853 (WHC-SD-WM-RPT-060) Solid Waste Program technical baseline description. Carlson, A.B. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 402p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE94014483. Source: OSTI; NTIS; GPO Dep.

The system engineering approach has been taken to describe the technical baseline under which the Solid Waste Program is currently operating. The document contains a mission analysis, function analysis, system definition, documentation requirements, facility and project bases, and uncertainties facing the program.

854 (WHC-SD-WM-RPT-099) Compliance matrix for the mixed waste disposal facilities, Trenches 31 & 34, burial ground 218-W-5. Carlyle, D.W. Westinghouse Hanford Co., Richland, WA (United States). 31 Oct 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004500. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Trench 31 & 34 Mixed Waste Disposal Facility Compliance Matrix is to provide objective evidence of implementation of all regulatory and procedural-institutional requirements for the disposal facilities. This matrix provides a listing of the individual regulatory and procedural-institutional requirements that were addressed. Subject matter experts reviewed pertinent documents that had direct or indirect impact on the facility. Those found to be applicable were so noted and listed in Appendix A. Subject matter experts then extracted individual requirements from the documents deemed applicable and listed them in the matrix tables. The results of this effort are documented in Appendix B.

855 (WHC-SD-WM-RPT-099-Rev.1) Compliance matrix for the Mixed Waste Disposal Facilities, Trenches 31 and 34, burial ground 218-W-5. Revision 1. Carlyle, D.W. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005135. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Trench 31 and 34 Mixed Waste Disposal Facility Compliance Matrix is to provide objective evidence of implementation of all regulatory and procedural-institutional requirements for the disposal facilities. This matrix provides a listing of the individual regulatory and procedural-institutional requirements that were addressed. Subject matter experts reviewed pertinent documents that had direct or indirect impact on the facility. Those found to be applicable were so noted and listed in Appendix A. Subject matter experts then extracted individual requirements from the documents deemed applicable and listed them in the matrix tables. The results of this effort are documented in Appendix B. The implementing compliance documentation for WHC-CM manuals is not included in Appendix B because these are, by definition, implementing documents.

856 (WHC-SD-WM-SAD-025-Rev.2) Hanford 300 Area treated effluent disposal facility - inventory at risk calculations and safety analysis. Revision 2. Berneski, L.D. Westinghouse Hanford Co., Richland, WA (United States). 22 Mar 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010113. Source: OSTI; NTIS; INIS; GPO Dep.

This document analyzes the TEDF for safety consequences. It includes radionuclide and hazardous chemical inventories, compares these inventories to appropriate regulatory limits, documents the compliance status with respect

to these limits, and identifies administrative controls necessary to maintain this status.

857 (WHC-SD-WM-SARR-028) **Solid waste burial grounds interim safety analysis.** Saito, G.H. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 452p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000438. Source: OSTI; NTIS; INIS; GPO Dep.

This Interim Safety Analysis document supports the authorization basis for the interim operation and restrictions on interim operations for the near-surface land disposal of solid waste in the Solid Waste Burial Grounds. The Solid Waste Burial Grounds Interim Safety Basis supports the upgrade progress for the safety analysis report and the technical safety requirements for the operations in the Solid Waste Burial Grounds. Accident safety analysis scenarios have been analyzed based on the significant events identified in the preliminary hazards analysis. The interim safety analysis provides an evaluation of the operations in the Solid Waste Burial Grounds to determine if the radiological and hazardous material exposures will be acceptable from an overall health and safety standpoint to the worker, the onsite personnel, the public, and the environment.

858 (WHC-SD-WM-SEL-012-Rev.4) **Burial grounds safety equipment list.** Whitlock, R.W. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005679. Source: OSTI; NTIS; INIS; GPO Dep.

This document lists all safety equipment for the low level Burial Grounds, per WHC-CM-5-5, Vol. 2, EI-013.

859 (WHC-SD-WM-SEL-036) **Waste sampling and characterization facility safety equipment list.** Meloy, R.T. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003080. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies equipment related to facility safety as required by WHC-CM-1-3, MRP 5.45. This document identifies the Safety Equipment for the Waste Sampling and Characterization Facility complex in accordance with MRP 5.46. The WSCF Final Safety Analysis Report (FSAR), WHC-SD-W011H-SAR-001, establishes the WSCF as a "Low Hazard Nuclear Facility." There are no Safety Class items as identified in DOE order 6430.1a. The maximum Safety Class established by the FSAR is Safety Class 3.

860 (WHC-SD-WM-TI-399-Rev.2) **616 Nonradioactive Dangerous Waste Storage Facility - Essential/support drawing list: Revision 2.** Busching, K.R. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001404. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the essential and supporting engineering drawings for the 616 Nonradioactive Dangerous Waste Storage Facility. The purpose of the documents is to describe the criteria used to identify and the plan for updating and maintaining their accuracy. Drawings are designated as essential if they relate to safety systems, environmental monitoring systems, effluents, and facility HVAC, electrical, and plumbing systems. Support drawings are those which are frequently used or describe a greater level of detail for equipment, components, or systems shown on essential

drawings. A listing of drawings identified as essential or support is provided in Table A.

861 (WHC-SD-WM-TI-404-Rev.3) **Central Waste Complex (CWC) essential/support drawing list. Revision 3.** Busching, K.R. Westinghouse Hanford Co., Richland, WA (United States). 3 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001530. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the essential and supporting engineering drawings for the Central Waste Complex (CWC). The purpose of the document is to describe the criteria used to identify and the plan for updating and maintaining their accuracy. This document supports Engineering Practices (EP) 1.3 and 2.2. This revision includes drawings that were not included in the original revision and updates our upgrade plans. Information presented describes the implementation plan of the essential drawing system. Because the accuracy of many of the essential and support drawings is in question, a major effort is required to upgrade them. Solid Waste Engineering Services is providing the design and drawing effort with technical input from the CWC Cognizant Engineer.

862 (WHC-SD-WM-TI-624) **Waste simulant development for evaluation of LLW melter system technology.** Shade, J.W. Westinghouse Hanford Co., Richland, WA (United States). 25 May 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013575. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the LLW simulant compositions, basis for the simulants, and recipes for preparing nonradioactive simulants for LLW melter tests.

863 (WHC-SD-WM-TI-686) **Immobilized low-level waste disposal options configuration study.** Mitchell, D.E. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 257p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008832. Source: OSTI; NTIS; INIS; GPO Dep.

This report compiles information that supports the eventual conceptual and definitive design of a disposal facility for immobilized low-level waste. The report includes the results of a joint Westinghouse/Fluor Daniel Inc. evaluation of trade-offs for glass manufacturing and product (waste form) disposal. Though recommendations for the preferred manufacturing and disposal option for low-level waste are outside the scope of this document, relative ranking as applied to facility complexity, safety, remote operation concepts and ease of retrieval are addressed.

864 (WHC-SD-WM-TRP-220) **Core sample truck improvement test report.** Cockrell, A.B. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002367. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the bit testing results done under test plan WHC-SD-WM-TP-236. The conclusions and recommendations state the drill bit that gives the best overall results and will be used in the field for push mode sampling.

865 (WHC-SD-WM-VI-011) **Test plan for evaluation of plasma melter technology for vitrification of high-sodium content low-level radioactive liquid wastes.** McLaughlin, D.F.; Lahoda, E.J.; Gass, W.R.; D'Amico, N.

(ed.). Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005434. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a test plan for the conduct of plasma arc vitrification testing by a vendor in support of the Hanford Tank Waste Remediation System (TWRS) Low-Level Waste (LLW) Vitrification Program. The vendor providing this test plan and conducting the work detailed within it [one of seven selected for glass melter testing under Purchase Order MMI-SVV-384212] is the Westinghouse Science and Technology Center (WSTC) in Pittsburgh, PA. WSTC authors of the test plan are D. F. McLaughlin, E. J. Lahoda, W. R. Gass, and N. D'Amico. The WSTC Program Manager for this test is D. F. McLaughlin. This test plan is for Phase I activities described in the above Purchase Order. Test conduct includes melting of glass frit with Hanford LLW Double-Shell Slurry Feed waste simulant in a plasma arc fired furnace.

866 (WHC-SD-WM-VI-014) Evaluation of plasma melter technology for verification of high-sodium content low-level radioactive liquid wastes: Demonstration test No. 4 preliminary test report. McLaughlin, D.F.; Gass, W.R.; Dighe, S.V.; D'Amico, N.; Swensrud, R.L.; Darr, M.F. Westinghouse Hanford Co., Richland, WA (United States). 10 Jan 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005624. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a preliminary report of plasma arc vitrification testing by a vendor in support of the Hanford Tank Waste Remediation System Low-Level Waste (LLW) Vitrification Program. Phase I test conduct included 26 hours (24 hours steady state) of melting of simulated high-sodium low-level radioactive liquid waste. Average processing rate was 4.9 kg/min (peak rate 6.2 kg/min), producing 7330 kg glass product. Free-flowing glass pour point was 1250 C, and power input averaged 1530 kW(e), for a total energy consumption of 19,800 kJ/kg glass. Restart capability was demonstrated following a 40-min outage involving the scrubber liquor heat exchanger, and glass production was continued for another 2 hours. Some volatility losses were apparent, probably in the form of sodium borates. Roughly 275 samples were collected and forwarded for analysis. Sufficient process data were collected for heat/material balances. Recommendations for future work include lower boron contents and improved tuyere design/operation.

867 (WHC-SD-WM-VI-015) Technical information report: Plasma melter operation, reliability, and maintenance analysis. Hendrickson, D.W. (ed.). Westinghouse Hanford Co., Richland, WA (United States). 14 Mar 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009142. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a technical report of operability, reliability, and maintenance of a plasma melter for low-level waste vitrification, in support of the Hanford Tank Waste Remediation System (TWRS) Low-Level Waste (LLW) Vitrification Program. A process description is provided that minimizes maintenance and downtime and includes material and energy balances, equipment sizes and arrangement, startup/operation/maintenance/shutdown cycle descriptions, and basis for scale-up to a 200 metric ton/day production facility. Operational requirements are provided including utilities, feeds, labor, and maintenance. Equipment reliability

estimates and maintenance requirements are provided which includes a list of failure modes, responses, and consequences.

868 (WHC-SD-WM-WP-245-Rev.1) B Plant low level waste system integrity assessment plan. Walter, E.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002143. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a plan for the design evaluation, corrosion assessment, visual examination and leak test of the B Plant Low Level Waste Tank System. The results of these activities will be used to assess the compliance of this low level waste system to the Washington State Department of Ecology requirements.

869 (WHC-SP-0665-14) Quarterly environmental radiological survey summary: Third quarter 1994-100, 200, 300, and 600 Areas. McKinney, S.M. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003213. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the radiological surveys performed on waste disposal sites located at the Hanford Site. The Third Quarter 1994 survey results and the status of actions required from current and past reports are summarized below: (1) All the routine environmental radiological surveys scheduled during July, August, and September 1994 were completed except for the D Island vent riser area. The surveys for the 200-W railways, spurs, and sidings were completed during this period after being delayed by equipment problems during the second quarter. (2) No Compliance Assessment Reports (CARs) were issued for sites found out of compliance with standards identified in WHC-CM-7-5, Environmental Compliance. (3) Two Surveillance Compliance/Inspection Reports (SCIRs) were closed during the Third Quarter of 1994. (4) Eleven open SCIRs had not been resolved.

870 (WHC-SP-0665-15) Quarterly environmental radiological survey summary: 100, 200, 300 and 600 Areas. Fourth quarter 1994. McKinney, S.M. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007187. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the radiological surveys performed on waste disposal sites located at the Hanford Site. The Fourth Quarter 1994 survey results and the status of actions required from current and past reports are summarized.

871 (WHC-SP-0992-1) Waste and decontamination services FY 94 Multi-Year Program Plan Phase II WBS No. 1.2.3. Cruz, E.A. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014580. Source: OSTI; NTIS; INIS; GPO Dep.

During the remediation of the Hanford Site large volumes of radioactive and mixed solid waste are expected to be produced, thus creating the need for subsequent decontamination, treatment, storage, and/or waste disposal. The program mission is to manage current and future contaminated solid waste streams in a safe, responsible, cost effective and legally compliant manner. This document

presents the strategy and technical requirements, along with key objectives and deliverables for the waste and decontamination services program for fiscal year 1994. Time schedules, cost estimates, and justification for each proposed activity are given in tables and charts.

872 (WHC-SP-1009-Rev.1) **Waste sampling and characterization facility (WSCF).** Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001985. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Sampling and Characterization Facility (WSCF) complex consists of the main structure (WSCF) and four support structures located in the 600 Area of the Hanford site east of the 200 West area and south of the Hanford Meteorology Station. WSCF is to be used for low level sample analysis, less than 2 mRem. The Laboratory features state-of-the-art analytical and low level radiological counting equipment for gaseous, soil, and liquid sample analysis. In particular, this facility is to be used to perform Resource Conservation and Recovery Act (RCRA) of 1976 and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 sample analysis in accordance with U.S. Environmental Protection Agency Protocols, room air and stack monitoring sample analysis, waste water treatment process support, and contractor laboratory quality assurance checks. The samples to be analyzed contain very low concentrations of radioisotopes. The main reason that WSCF is considered a Nuclear Facility is due to the storage of samples at the facility. This maintenance Implementation Plan has been developed for maintenance functions associated with the WSCF.

873 (WINCO-1211) **Evaluation of soil washing for radiologically contaminated soils.** Gombert, D. II. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Mar 1994. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94014944. Source: OSTI; NTIS; INIS; GPO Dep.

Soil washing has been applied internationally to decontaminate soils due to the widespread increase in environmental awareness manifested in the United States by promulgation of the Comprehensive Environmental Response, Compensation and Liability Act, yet we continue to lack understanding on why the technique works in one application and not in another. A soil washing process typically integrates a variety of modules, each designed to decontaminate the matrix by destroying a particular phase or segregating a particle size fraction in which the contaminants are concentrated. The more known about how the contaminants are fixed, the more likely the process will succeed. Much can be learned from bioavailability studies on heavy metals in soils. Sequential extraction experiments designed to destroy one fixation mechanism at a time can be used to determine how contaminants are bound. This knowledge provides a technical basis for designing a processing strategy to efficiently decontaminate soil while creating a minimum of secondary wastes. In this study, a soil from the Idaho National Engineering Laboratory was physically and chemically characterized, then sequentially extracted to determine if soil washing could be effectively used to remove cesium, cobalt and chromium.

874 (WINCO-1214) **A proposed methodology for evaluating low-level radioactively-contaminated soil.**

Alexander, D.R. (Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States)); Clarke, G.W.; Dickson, R.L. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Sep 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE95000775. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared to support the development of residual radioactivity criteria for disposition of contaminated soil locations at the Idaho National Engineering Laboratory (INEL). The criteria is primarily for use in making decisions regarding disposition of sites at the INEL that have low levels of radioactive contamination that are not already in an Operable Unit (OU) or Waste Area Group (WAG) identified under the Federal Facility Agreement and Consent Order (FFA/CO) process in place at the INEL. The report describes the development of screening level concentrations for selected radionuclides in soils in the environment at the INEL. These screening levels are based on environmental conditions at the INEL and are generically applicable to the site. They are intended to provide a consistent technical basis for operational decisions regarding the disposition of sites contaminated with low levels of radioactivity prior to final remediation. They are not intended to be used in lieu of the remediation process defined under the FFA/CO, nor as clean-up levels for locations where remediation is required. This report presents the development of screening levels that are based on a site-specific pathway analysis using the DOE-recommended RESRAD code. RESRAD results for screening level calculations are presented in Appendix A.

875 (WSRC-MS-94-0308) **Comparison of TCLP and long-term PCT performance on low-level mixed waste glasses.** Cicero, C.A.; Andrews, M.K.; Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940815-19: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013290. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Integrated Program (MWIP) of the US Department of Energy (DOE) is currently investigating technologies for conversion of low-level mixed waste (LLMW) into a form suitable for permanent disposal. Vitrification is one of the preferred technologies since it is capable of consistently producing a durable, leach resistant wasteform, while simultaneously minimizing disposal volumes. Since vitrification of LLMW is a relatively new concept, final wasteform specifications have not been developed. The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company (WSRC) has developed the Product Consistency Test (PCT), which is a 7-day leaching procedure for glass. Comparison indicates that both tests have merit where LLMW glasses are concerned. The TCLP is an important test for determining the release of metals and for allowing the wasteform to be delisted while the PCT is more useful for determining consistent production of durable glass. It is a better indicator of the behavior of glass in disposal site conditions. Most aggressive leaching of common oxide glasses occurs under caustic rather than acidic conditions, therefore it is necessary to perform both tests. Further tests will be conducted using additional glass compositions and variations in the TCLP and the PCT.

876 (WSRC-MS-94-0569) **Vitrification of hazardous and radioactive wastes.** Bickford, D.F.; Schumacher, R.

Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9411154-1: Fall meeting of the American Ceramic Society, Columbus, OH (United States), 14-18 Nov 1994). Order Number DE95003460. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification offers many attractive waste stabilization options. Versatility of waste compositions, as well as the inherent durability of a glass waste form, have made vitrification the treatment of choice for high-level radioactive wastes. Adapting the technology to other hazardous and radioactive waste streams will provide an environmentally acceptable solution to many of the waste challenges that face the public today. This document reviews various types and technologies involved in vitrification.

877 (WSRC-MS-94-0662) Effect of Saltstone Vault Roof Configuration on the Rate of Contaminant Transport. Hsu, R.H.; Yu, A.D.; Lam, Poh-Sang. Westinghouse Savannah River Co., Aiken, SC (United States). 28 Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950439-12: SMS simulation multicongress: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95060103. Source: OSTI; NTIS; INIS; GPO Dep.

At the Savannah River Site, low-level radioactive decontaminated salt solution is mixed with slag, flyash, and cement to form a grout-like material called "Saltstone". The Saltstone is poured into concrete vaults constructed at the Saltstone Disposal Facility (SDF). The impact of SDF on groundwater has been studied in a radiological performance assessment (PA). Sophisticated groundwater models were used to predict the groundwater flow and contaminant transport problems. The modeling effort was divided into two parts: the unsaturated-zone model and the saturated zone model. One of the major performance objectives is to show that the impacted groundwater will be in compliance with the Safe Drinking Water Act.

878 (WSRC-MS-95-0012) Vitrification Studies with DOE Low-Level Mixed Waste Wastewater Treatment Sludges. Cicero, C.A. (Westinghouse Savannah River Co., Aiken, SC (United States)); Andrews, M.K.; Bickford, D.F.; Hewlett, K.J.; Bennert, D.M.; Overcamp, T.J. Westinghouse Savannah River Co., Aiken, SC (United States). 13 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-5: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95060083. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification studies with simulated Low Level Mixed Waste (LLMW) sludges were performed at the Savannah River Technology Center (SRTC). These studies focused on finding the optimum glass compositions for four simulated LLMW wastewater treatment sludges and were based on both crucible-scale and pilot-scale studies. Optimum compositions were determined based on the maximum waste loading achievable without sacrificing glass integrity.

879 (WSRC-MS-95-0028) Development of a Transportable Vitrification System for Mixed Waste. Whitehouse, J.C. (Westinghouse Savannah River Co., Aiken, SC (United States)); Jantzen, C.M.; Bickford, D.F.; Kielpinski, A.L.; Helton, B.D.; Van Ryn, F. Westinghouse Savannah River Co., Aiken, SC (United States). 13 Jan 1995.

6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-9: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95060087. Source: OSTI; NTIS; INIS; GPO Dep.

The US DOE through the Mixed Waste Integrated Program, has identified a need to move mixed waste vitrification technology from the laboratory to the field as rapidly as possible. A great deal of work over the last few years has shown the feasibility of immobilizing selected hazardous waste streams in a vitrified product. Lab-scale work has been extended to pilot-scale tests, usually with surrogates of the actual waste. DOE felt that the technology was mature enough to allow demonstration in the field, on actual wastes, with units that would be prototypic of full sized waste treatment equipment. To this end, DOE's Office of Technology Development sponsored the Westinghouse Savannah River Company (WSRC) to specify, procure, test, and operate a field scale demonstration using mobile equipment. Oak Ridge Reservation was chosen as the initial location for the field demonstration and Martin Marietta Reservation was chosen as the initial location for the field demonstration and Martin Marietta Energy Systems (MMES) tasked with all permitting, site preparation, and field support activities. During September 1993, WSRC used a "Vendor Forum" to solicit preliminary proposals for the Transportable Vitrification System (TVS). A number of quality proposals were received and evaluated. A vendor was selected and detailed negotiations were completed in August 1994, at which time a contract was signed for the TVS. In parallel, WSRC opened a dialogue with MMES to explore candidate waste streams at the Oak Ridge Reservation for the first TVS vitrification campaign. After some preliminary work, a group of waste water sludges were selected. The first of these to be demonstrated with the TVS will be the West End Treatment Facility (WETF) sludge. This paper describes the development of the specification for the TVS, the design and construction activities to date, and ongoing efforts for permitting and site support. The schedule for field application is also discussed.

880 (WSRC-MS-95-0056) Development of Plasma Vitrification Technology for Contaminated Soil at the Savannah River Site. Kielpinski, A.L. (Westinghouse Savannah River Co., Aiken, SC (United States)); Marra, J.C.; Rogers, V.; Schumacher, R.F.; Etheridge, J.; Kirkland, R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-35: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95060091. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Integrated Program (MWIP) of the United States Department of Energy's Office of Technology Development is developing treatment technologies for a wide variety of materials containing mixed low-level waste, i.e., having low levels of radioactivity along with hazardous constituents. Vitrification is a promising treatment technology for many of these wastes, including contaminated soil such as that found at the Savannah River Site. Proof-of-principle tests were performed to demonstrate the feasibility of both ex-situ and in-situ vitrification of contaminated soil by means of a plasma torch. A mixture of 89 percent as-excavated Savannah River Site sandy clay loam with 11 percent lime addition was tested. Vitrification of a mixture of this feed, in a 10 in. diameter crucible with a non-transferred arc plasma torch at a nominal 160 kW, was successful. The process

produced homogeneous glass (albeit with local compositional variations), surrounded by a skull of incompletely reacted feed. Characterization of the resultant product durability using the Product Consistency Test showed elemental leaching well below the Environmental Assessment glass (which is often used as a minimum standard of glass acceptability in high-level waste glass assessment) for both the glass and the skull regions. Future tests should include doping the soil with hazardous constituents to enable further verification of the wasteform integrity via the Toxic Characteristic Leaching Procedure. In-situ operation was mimicked in the test crucible by segregating the lime additive from the soil within the crucible. Making full use of the available torch maneuvering capabilities (which would likely exceed those of a torch used in-situ) failed to produce a homogeneous melt. Therefore, intimate mechanical mixture of the additive with the soil appears crucial to the success of SRS soil vitrification, and must be included in design considerations for in-situ operation.

881 (WSRC-RP-94-00062) Rocky Flats Plant precipitate sludge surrogate vitrification demonstration: Technical Task Plan. Cicero, C.A. (Westinghouse Savannah River Co., Aiken, SC (United States)); Bickford, D.F.; Bennert, D.M.; Overcamp, T.J. Westinghouse Savannah River Co., Aiken, SC (United States); Clemson Univ., SC (United States). Dept. of Environmental Systems Engineering. 17 Jun 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94018732. Source: OSTI; NTIS; INIS; GPO Dep.

Technologies are being developed by the US Department of Energy's (DOE) Nuclear Facility sites to convert hazardous and mixed wastes to a form suitable for permanent disposal. The preferred disposal method would be one that is capable of consistently producing a durable leach resistant wasteform, while simultaneously minimizing disposal volumes. Vitrification, which has been declared the Best Demonstrated Available Technology (BDAT) for high-level radioactive waste disposal by the EPA, is capable of producing a highly durable wasteform that minimizes disposal volumes through organic destruction, moisture evaporation, and porosity reduction. However, this technology must be demonstrated over a range of waste characteristics, including compositions, chemistries, moistures, and physical characteristics to ensure that it is suitable for hazardous and mixed waste treatment.

882 (WSRC-RP-94-00780) Los Alamos National Laboratory simulated sludge vitrification demonstration. Cicero, C.A. (Westinghouse Savannah River Co., Aiken, SC (United States)); Bickford, D.F.; Bennert, D.M.; Overcamp, T.J. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Sep 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95004344. Source: OSTI; NTIS; INIS; GPO Dep.

Technologies are being developed to convert hazardous and mixed wastes to a form suitable for permanent disposal. Vitrification, which has been declared the Best Demonstrated Available Technology (BDAT) for high-level radioactive waste disposal by the EPA, is capable of producing a highly durable wasteform that minimizes disposal volumes through organic destruction, moisture evaporation, and porosity reduction. However, this technology must be demonstrated over a range of waste characteristics, including compositions, chemistries, moistures, and physical characteristics to ensure that it is suitable for hazardous and

mixed waste treatment. This project plans to demonstrate vitrification of simulated wastes that are considered representatives of wastes found throughout the DOE complex. For the most part, the primary constituent of the wastes is flocculation aids, such as $\text{Fe}(\text{OH})_3$, and natural filter aids, such as diatomaceous earth and perlite. The filter aids consist mostly of silica, which serves as an excellent glass former; hence, the reason why vitrification is such a viable option. LANL is currently operating a liquid waste processing plant which produces an inorganic sludge similar to other waste water treatment streams. Since this waste has characteristics that make it suitable for vitrification and the likelihood of success is high, it shall be tested at CU. The objective of this task is to characterize the process behavior and glass product formed upon vitrification of simulated LANL sludge. The off-gases generated from the production runs will also be characterized to help further develop vitrification processes for mixed and low level wastes.

883 (WSRC-TR-93-762) Selection of melter systems for the DOE/Industrial Center for Waste Vitrification Research. Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). 31 Dec 1993. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001476. Source: OSTI; NTIS; INIS; GPO Dep.

The EPA has designated vitrification as the best developed available technology for immobilization of High-Level Nuclear Waste. In a recent federal facilities compliance agreement between the EPA, the State of Washington, and the DOE, the DOE agreed to vitrify all of the Low Level Radioactive Waste resulting from processing of High Level Radioactive Waste stored at the Hanford Site. This is expected to result in the requirement of 100 ton per day Low Level Radioactive Waste melters. Thus, there is increased need for the rapid adaptation of commercial melter equipment to DOE's needs. DOE has needed a facility where commercial pilot scale equipment could be operated on surrogate (non-radioactive) simulations of typical DOE waste streams. The DOE/Industry Center for Vitrification Research (Center) was established in 1992 at the Clemson University Department of Environmental Systems Engineering, Clemson, SC, to address that need. This report discusses some of the characteristics of the melter types selected for installation of the Center. An overall objective of the Center has been to provide the broadest possible treatment capability with the minimum number of melter units. Thus, units have been sought which have broad potential application, and which had construction characteristics which would allow their adaptation to various waste compositions, and various operating conditions, including extreme variations in throughput, and widely differing radiological control requirements. The report discusses waste types suitable for vitrification; technical requirements for the application of vitrification to low level mixed wastes; available melters and systems; and selection of melter systems. An annotated bibliography is included.

884 (WSRC-TR-95-0039) Elemental analysis of waste glass by x-ray fluorescence spectrometry. Bickford, D.F. (Westinghouse Savannah River Co., Aiken, SC (United States)); Jurgensen, A.R.; Resce, J.L.; Ragsdale, R.G.; Overcamp, T.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-124: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995).

Order Number DE95010973. Source: OSTI; NTIS; INIS; GPO Dep.

An X-ray fluorescence (XRF) technique is reported which shows promise for the elemental analysis of low-level mixed waste glasses. This technique can be used for both quantitative laboratory analysis and process control. The glass-forming melts are cast into graphite molds and resulting disks are annealed and polished. The disk is then analyzed with a wavelength dispersive X-ray fluorescence spectrometer and the elemental intensities are converted into concentration with a fundamental parameters routine without the use of matrix-matched standards. Precision of elemental determinations are all better than one percent relative standard deviation. The XRF analysis has been compared with a reference method utilizing conventional wet chemical dissolution techniques followed by atomic spectroscopic determination. Results show that there is no significant difference between these two techniques, however, the XRF technique is much simpler and faster than the wet chemical methods.

885 (WTD-92-046) Waste management facilities cost information estimating data. Feizollahi, F. (Morrison-Knudsen Corp., Boise, ID (United States). Environmental Services Div.); Shropshire, D. EG and G Idaho, Inc., Idaho Falls, ID (United States); Morrison-Knudsen Corp., Boise, ID (United States). Environmental Services Div. Oct 1992. 319p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95009462. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains cost estimating support data for the Waste Management Facility Cost Information (WMFCI) task. The WMFCI task was commissioned by the U.S. Department of Energy (DOE) to develop planning level life-cycle cost (PLCC) estimates for treatment, storage, and disposal facilities. The report contains PLCC estimates versus capacity for 26 different facility cost modules. Estimates in the report apply to five distinctive waste streams: low-level waste, low-level mixed waste, alpha contaminated low-level waste, alpha contaminated low-level mixed waste, and transuranic waste. The report addresses five different treatment types: incineration, metal/melting and recovery, shredder/compaction, solidification, and vitrification.

886 Demonstration of vitrification of surrogate F006 waste-water treatment sludges. Bennert, D.M. (Clemson Univ. Environmental Systems Engineering, Anderson, SC (United States)); Overcamp, T.J.; Bickford, D.F.; Jantzen, C.M.; Cicero, C.A. pp. 59-72 of Ceramic transactions: Environmental and waste management issues in the ceramic industry II. Volume 45. Bickford, D.; Bates, S.; Jain, V.; Smith, G. (eds.). American Ceramic Society, Westerville, OH (United States) (1994). pp. 513 (CONF-940416-: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994).

A demonstration program with the focus on vitrification of surrogate formulations of Savannah River Site M-Area wastewater treatment sludges has been completed. The program utilized commercially available melting equipment, supplied by EnVitCo, Inc., and Stir Melter, Inc., located at the Clemson-University Environmental Systems Engineering Laboratories. Over 2000 kg of glass was manufactured in a series of five separate tests with four formulations. Glasses were characterized by Toxicity Characteristic Leaching Procedure (TCLP) and the Product Consistency Test (PCT), with all glasses showing leach characteristics better than Land Disposal Requirements (LDR) for corresponding F006

waste (TCLP) and benchmark environmental assessment glasses (PCT). Offgas sampling by EPA Method 5 was conducted, including chemical analysis of filter residue and impinger solution. Data is presented on glass leaching, off-gas sampling, phase separation, and melter performance.

887 Operational feasibility of the vitrification of an organic ion exchange resin. Sargent, T.N. Jr. (Clemson Univ., Anderson, SC (United States)); Bennert, D.M.; Overcamp, T.J.; Bickford, D.F. pp. 73-89 of Ceramic transactions: Environmental and waste management issues in the ceramic industry II. Volume 45. Bickford, D.; Bates, S.; Jain, V.; Smith, G. (eds.). American Ceramic Society, Westerville, OH (United States) (1994). pp. 513 (CONF-940416-: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994).

Vitrification has been declared by the Environmental Protection Agency (USEPA) as the Best Demonstrated Available Technology (BDAT) for the permanent disposal of high-level radioactive waste. Savannah River Site currently uses a sodium tetraphenylborate (NaTPB) precipitation process to remove Cs-137 from a wastewater solution created from the processing of nuclear fuel. This process has several disadvantages such as the formation of a benzene waste stream. It has been proposed to replace the precipitation process with an ion exchange process using a new resorcinol-formaldehyde resin developed by Savannah River Technical Center (SRTC). Preliminary tests, however, showed that problems such as crust formation and a reduced final glass wasteform exist when the resin is placed in the melter environment. The newly developed stirred melter could be capable of overcoming these problems. This research explored the operational feasibility of using the stirred tank melter to vitrify an organic ion exchange resin. These tests included crucible studies to determine the reducing potential of the resin and the extent of oxygen consuming reactions and oxygen transfer tests to approximate the extent of oxygen transfer into the molten glass using an impeller and a combination of the impeller and an external oxygen transfer system. These preliminary studies will be used as a basis for using the stirred tank melter to vitrify nonradioactive cesium loaded organic ion exchange resin.

888 Minimizing risk associated with shallow burial of waste in semiarid ecosystems: Erosion and vegetation dynamics. Breshears, D.D. (Los Alamos National Lab., NM (United States). Environmental Science Group); Martens, S.N.; Nyhan, J.W.; Springer, E.P.; Wilcox, B.P. pp. 97 of Society of Environmental Toxicology and Chemistry 15th annual meeting: Abstract book. Ecological risk: Science, policy, law, and perception. Society of Environmental Toxicology and Chemistry, Pensacola, FL (United States) (1994). pp. 286 (CONF-9410273-: 15. annual meeting of the Society of Environmental Toxicology and Chemistry (SETAC), Denver, CO (United States), 30 Oct - 3 Nov 1994).

Numerous regulations govern the disposal of low-level radioactive and hazardous waste by burial in shallow pits. The overall goal of these regulations is to reduce the risk to humans and components of the ecosystem for 500 to 1 000 years. Erosional loss of the soil profile covering waste and contamination of groundwater by leachate are two pathways that influence human and ecological risks. Screening calculations for a waste site in a pinyon-juniper woodland at Los Alamos National Laboratory predict the entire 2 m cover of a waste site could be lost by erosion in less than 500 years. In contrast, less than 0.001% of the waste would reach groundwater by leachate. Predicted erosion rates depend highly on

plant cover. The boundary between ponderosa pine forest and pinyon-juniper woodland has shifted more than 1 km in less than 50 years in the Los Alamos region and additional boundary shifts have been hypothesized in conjunction with global warming. High erosion rates (> 0.2 cm per year) have been measured in these transition zones. In concert, these results suggest that risk associated with erosional loss of the waste site cover may greatly exceed risks associated with groundwater contamination in semiarid ecosystems.

889 Pyrochemical salt scrub. Dodson, K.E. (Martin Marietta Energy Systems, Oak Ridge, TN (United States)); Johnson, G.W.; McAvoy, D.P.; Holck, D.M. pp. 225-232 of *Actinide processing: Methods and materials*. Mishra, B. (ed.); Averill, W.A. (ed.). The Minerals, Metals and Materials Society, Warrendale, PA (United States) (1994). pp. 408 (CONF-940204-: 123. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 Mar 1994).

A pyrochemical salt scrub process for calcium chloride based salts, that eliminates the waste generated during aqueous processing and the associated chloride corrosion problem, is being developed and tested at Lawrence Livermore National Laboratory. In the scrub process, calcium metal is used to reduce the actinide chlorides present in residue pyrochemical salts to a metal product, called a metal button. The metal button can be stored, converted to an oxide for storage, recycled, or further refined using aqueous processing to separate the plutonium from the americium, if plutonium recovery is required. It has been determined that a calcium titration of molten salt extraction and electrorefining residue salts can be used to determine reaction completion and to prevent the addition of excess calcium to the process. An automated calcium feeder and associated control system have been designed and built to monitor the salt scrub process and to determine when calcium metal should be fed.

890 An efficient technique for locating and removing dense non-aqueous phase liquids in-situ. LaVenue, A.M. (INTERA Inc., Austin, TX (United States)); Jackson, R.E. pp. 351-360 of *Superfund XIV conference and exhibition: Proceedings. Volume 1. Hazardous Materials Control Resources Inst., Rockville, MD (United States) (1994). pp. 760 (CONF-9311122-: Superfund 14: conference and exhibition, Washington, DC (United States), 30 Nov - 2 Dec 1993).*

Dense, non-aqueous phase liquids or DNAPLs, in particular chlorinated solvents such as trichloroethylene and carbon tetrachloride, pose an as-yet unresolved ground-water contamination problem at hazardous waste sites across the nation. The mobility of DNAPLs in the subsurface, their low aqueous solubility and the heterogeneity of typical aquifer systems combined to create conditions that inhibit easy characterization of DNAPL sites and the rapid remediation by traditional pump-and-treat methods. Surfactant-enhanced methods for DNAPL-site remediation accelerate the pace of remediation in granular aquifer systems, e.g., alluvium and outwash. The importance of adequate hydraulic conductivity and aquitard conditions is stressed in the application of surfactant-enhanced aquifer remediation (SEAR).

891 Bioprocessing of concentrated mixed hazardous industrial waste. Wolfram, J.H. (Montana State Univ., Bozeman, MT (United States)); Rogers, R.D.; Silver, G.; Attalla, A.; Prisc, M. pp. 407, Paper COLL 101 of 208th ACS national meeting. American Chemical Society,

Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

The use of selected microorganisms for the degradation and/or the detoxification of hazardous organic compounds is gaining wide acceptance as an alternative waste treatment technology. This work describes the unique capabilities of an isolated strain of *Pseudomonas* for metabolizing methylated aromatic compounds. This strain of *Pseudomonas putida* Idaho is unique in that it can tolerate and grow under a layer of neat p-xylene. A bioprocess has been developed to degrade LLW and mixed wastes containing methylated aromatic compounds, i.e., pseudocumene, toluene and p-xylene. The process is now in the demonstration phase at a DOE facility and has been running for one year. Feed concentrations of 21200 ppm of the toxic organic substrate have been fed to the bioreactor. This report describes the results obtained thus far.

892 Analytical measurements for the actinides in Los Alamos National Lab. nuclear waste streams. Cisneros, M.R. (Los Alamos National Lab., NM (United States)); Attrep, M. Jr.; Covey, J.R.; Midkiff, W.S. pp. 418, Paper TECH 3 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Several actinides are commonly present in the controlled waste streams at Los Alamos National Lab. (LANL). Acid waste lines carry the radioactive liquid waste from various technical areas to a central treatment facility. Following treatment, the water is discharged in accordance with DOE guidelines. This liquid waste must be treated for the removal of alpha emitting nuclides. The treated water must be analyzed for alpha activity to comply with regulatory guidelines. The authors have attempted to develop a quick, reliable method to determine the alpha activity in those treated waters. The usual EPA procedures for making those measurements were found not to be applicable for making the measurement on these influent and effluent waters because of their chemical and physical complexities. The authors have been forced into analyzing each actinide separately at the 1-10 picocurie per liter level on a large number of samples. This analytical work has also supported the investigation of new water treatment technologies for actinide removal and a critical review of the presently recommended analytical chemistry for the actinide elements associated with environmental samples.

893 XRF in waste glass analysis and vitrification process control, Part 1: Sample preparation and measurement precision. Resce, J.L. (Clemson Univ., SC (United States)); Ragsdale, R.G.; Overcamp, T.J.; Jurgensen, A.; Cicero, C.; Bickford, D.F. pp. 461-472 of *Ceramic transactions: Environmental and waste management issues in the ceramic industry II. Volume 45*. Bickford, D.; Bates, S.; Jain, V.; Smith, G. (eds.). American Ceramic Society, Westerville, OH (United States) (1994). pp. 513 DOE Contract AC09-89SR18035. (CONF-940416-: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994).

The analysis of several waste glasses has been carried out by X-ray fluorescence (XRF) spectrometry in an attempt to develop a simple, rapid, and consistent procedure for specimen preparation. Glass disk specimens, suitable for XRF analysis, can be prepared by casting the melt directly

into a preheated graphite mold followed by annealing for 30 minutes at 500°C. With this technique specimens could be available for analysis within 45 minutes. Element x-ray intensities, measured from replicate specimens, were found to be highly reproducible, with relative standard deviations typically less than one percent. This XRF analysis is much more rapid and may afford greater accuracy than conventional wet chemical techniques in waste glass analysis. Furthermore, this XRF analysis may be used in vitrification process control by permitting on-site monitoring of glass composition. A product control strategy is discussed.

894 Dynamic metal vaporization and binding during thermal treatment of metal-containing soil. Ho, T.C. (Lamar Univ., Beaumont, TX (United States)); Shiao, C.C.; Chu, H.W.; Hopper, J.R.; Bostick, W.D. pp. 536, Paper ENVR 55 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The objective of this study was to experimentally investigate the dynamic characteristics of metal vaporization and binding during thermal treatment of artificially prepared metal-containing clay. Experiments were performed in a well-instrumented 76 mm (3 inch) ID fluidized bed thermal treatment unit. The metals involved were compounds of lead and cadmium and the operating parameters included treatment duration, treatment temperature and air flow rate. The results indicated that metals may stay in clay or vaporize during treatment. The rate of metal vaporization decreases with treatment time due to chemical reactions between metals and clay matrix. The amount of metal vaporization was found to range from 5 to 30% depending on metal species and treatment temperature. The metals staying in clay may be leachable or non-leachable also depending on metal species and operating conditions.

895 The hydrogen-electrode concentration cell as a sensitive tool in high temperature aqueous chemistry. Palmer, D.A. (Oak Ridge National Lab., TN (United States)); Wesolowski, D.J.; Mesmer, R.E. pp. 706, Paper I&EC 26 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 DOE Contract AC05-84OR21400. (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

The high-temperature, hydrogen-electrode concentration cell originally designed at ORNL has been used extensively to investigate the thermodynamics of hydrolysis and complexation equilibria involving aqueous solutions to 300°C. The effectiveness and reliability of this potentiometric technique using "a cell with liquid junction" is manifested in the wide range of equilibria that have been studied, and the accuracy is well established by comparisons of these results with those obtained by other methods, which are often restricted to near ambient conditions. Recently, this cell has been shown to have even greater versatility in studying such processes as: competitive complexation between acetate and chloride ligands for transition metal ions; the hydrolysis of metals that form sparingly-soluble hydroxo species; the kinetics of decomposition of carboxylic acids; and the H^+/OH^- adsorption profiles of insoluble metal oxides (e.g., TiO_2).

896 Mass transfer in aqueous biphasic systems. Chaiko, D.J. (Argonne National Lab., IL (United States)); Rollins, A.; Van Deventer, E.; Ward, P. pp. 723, Paper I&EC

20 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 DOE Contract W-31109-ENG-38. (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The authors studied the kinetics of mass transfer for several water soluble solutes in aqueous biphasic systems comprised of polyethylene glycol (PEG)/salt mixtures. This work was prompted by anomalous partitioning behavior of metal ions that the authors encountered in the literature in their own lab. In certain biphasic systems, the authors obtained reproducible extraction isotherms that showed a decrease in solute partitioning with increasing mixing time. The authors have found that incomplete phase separation, even with prolonged centrifugation, was a source of error. The authors discuss the results of this study and present an alternative approach for measuring partition coefficients.

897 Electron beam microanalysis of nuclear waste glass. Buck, E.C. (Argonne National Lab., IL (United States)); Bates, J.K. pp. 728, Paper I&EC 98 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Analytical electron microscopy has been used to characterize secondary phases produced during the corrosion of waste glass in order to interpret glass dissolution behavior. The techniques of X-ray energy dispersive spectroscopy (EDS) and electron energy loss spectroscopy (EELS) have been applied to detect low levels of radionuclides within the glass and alteration phases. EELS has a greater sensitivity for elements with atomic numbers >10 (such as boron). For many other elements EDS and EELS detection limits are similar, however, for the rare earth elements and actinides. EELS can be more sensitive due to the high cross section of the $M_{4,5}$ edges for REEs and the $O_{4,5}$ edges for actinides. Due to the poorer energy resolution of EDS detectors (~ 140 eV), overlap often occurs, whereas EELS can often resolve such overlap with its superior energy resolution (<2 eV). EELS methods to improve detection limits for actinides and REEs in sub-micron phases have been performed.

898 Recent advances in the separation of actinides by liquid-liquid extraction, extraction chromatography, and ion exchange. Horwitz, E.P. (Argonne National Lab., IL (United States)); Chiarizia, R.; Diamond, H.; Dietz, M.; Leonard, R.A. pp. 762, Paper I&EC 159 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 DOE Contract W-31109-ENG-38. (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

During the last few years a number of advances in the separation of the actinides have been made with the development of advanced liquid-liquid extraction processes for processing high-level liquid waste, with the commercialization of a number of extraction chromatographic resins, and with the development of the new chelating ion exchange resin. A description of the aqueous mixed-waste processing systems in the Chemistry Division at ANL, and examples of flowsheets that utilize the extraction chromatographic resins for the processing of bioassay and environmental samples and that utilize the new process solvents for the processing of high-level liquid waste are presented.

899 Uranium recovery from contaminated soil. Chaiko, D.J. (Argonne National Lab., IL (United States)); Mensah-Biney, R. pp. 772-773, Paper I&EC 198 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 DOE Contract W-31109-ENG-38. (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The authors are developing aqueous biphasic separation (ABS) processes for the recovery of actinides from contaminated soils and radioactive wastes. The ABS process involves the selective partitioning of ultra-fine particles between two immiscible aqueous phases. The authors are currently conducting pilot-scale studies on the treatment of uranium contaminated soil from Fernald, OH. The goal is to selectively separate and recover ultra-fine particulate uranium from the soil in a highly concentrated form without altering the physicochemical properties of the soil particles. The authors discuss results of the initial scale-up tests.

900 Metal binding studies of triaminotriethylaminehexa-N-acetic acid (TTAHA) and other tren derivatives. Thompson, J.A. (Los Alamos National Lab., NM (United States)); Douglas, H.M.; Barr, M.E.; Sauer, N.N.; Smith, P.H. pp. 807, Paper INOR 90 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

As models for polymeric systems that remove Pb(II) from contaminated soils, the authors are preparing and characterizing carboxylates and other derivatives of tris(2-aminoethyl)amine (tren) for metal binding studies. Although the metal-binding properties of the ligand TTAHA were previously investigated, no binding constants have been reported. The authors are determining binding constants for this ligand through potentiometric titrations to determine if it shows improved binding properties over its isomer triethylenetetraminehexacetic acid (TTHA) and other polyaza polycarboxylate ligands. Also, the authors are investigating the binding modes for different metals through NMR and UV-Vis spectroscopy. Other tren derivatives such as triaminotriethylaminetri-n-acetic acid and triaminotriethylaminehexa-n-hydroxamic acid are also being investigated.

901 Synthesis of polymer pendant sulfonated catechol and linear catechol amide ligands and their selective reactions with metals ions in aqueous solution. Li, W. (Univ. of California, Berkeley, CA (United States)); Huang, S.; Fish, R.H.; Albright, R.L.; Fries, W. pp. 810-811, Paper INOR 101 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 DOE Contract AC03-76SF00098. (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Polymer pendant ligand chemistry will be an important remediation technique for the selective removal and recovery of toxic and economically important metal ions from environmental aqueous solutions. The authors present results on the synthesis of new polymer pendant sulfonated catechol (CATS) and sulfonated 3,3 and 3,4-linear catechol amide (3,3 and 3,4-LICAMS) ligands and their selective reactions with Fe^{3+} , Cu^{2+} , Zn^{2+} , and Hg^{2+} ions at various pH values. Kinetic studies for rates of removal of the above-mentioned metals from aqueous solutions at different pH values and

the rates of regeneration of the polymer pendant ligand site for the recovery of these metal ions are also presented.

902 Synthetic strategies for the monofunctionalization of an octaazacryptand for attachment to a polymer backbone. Hallman, J.L. (Los Alamos National Lab., NM (United States)); Smith, P.H.; Hermes, R.E. pp. 818, Paper INOR 127 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The all-nitrogen donor atom analog to cryptand [2.2.2], 1,4,7,10,13,16,21,24-octaazabicyclo-[8.8.8]hexacosane, has shown tremendous selectivity for fluoride anion versus chloride anion at low pH. It also has the potential ability to bind well with several "soft," environmentally important cations. The authors have undertaken synthetic approaches to provide a selectively monofunctionalized cryptand to allow attachment to a polymeric backbone through a single tether. Various strategies for the attachment of the tether are discussed, including the use of complexed transition metal cations as blocking groups.

903 Development and field validation of a microcosm to simulate the mercury cycle in a contaminated pond. Saouter, E. (Univ. of West Florida, Gulf Breeze, FL (United States). Center for Environmental Diagnostics and Bioremediation); Gillman, M.; Turner, R.; Barkay, T. *Environmental Toxicology and Chemistry (United States)*; 14(1): 69-77 (Jan 1995).

A microcosm consisting of water, sediment, and air compartments was used to simulate mercury geochemical cycling in a mercury-contaminated pond at Oak Ridge, Tennessee. Total and dissolved mercury and total methylmercury were analyzed in water and sediment; total gaseous mercury and head-space mercury were analyzed in the water and head space, respectively. The production of gaseous mercury was correlated to dissolved mercury, and methylmercury was mainly produced in the sediment compartment. Addition of mercuric chloride to the system increased the production of head-space mercury by a factor of 10 but did not affect the methylation rate. Saturation of gaseous mercury in microcosm water varied from 480 to 1,500% of the solubility of elemental mercury and was controlled by unidentified factors. The microcosm maintained stable conditions for up to 3 weeks, and a mass balance indicated that it reasonably simulated the cycling of mercury in the pond. This microcosm could be used to test remedial treatments aimed at decreasing the amount of mercury that is available for accumulation by biota.

904 Simple method for technetium removal from aqueous solutions. Del Cul, G.D. (Oak Ridge National Lab., TN (United States)); Bostick, W.D. *Nuclear Technology (United States)*; 109(1): 161-162 (Jan 1995).

Because of an increasing need for ^{99}Tc removal from treatment solutions during waste processing and environmental cleanups, several inexpensive sorbents were investigated. Here, Packed-column experiments with iron dust of 40 to 60 mesh (Fisher I-57) showed an excellent uptake of pertechnetate ions from alkaline (pH ~ 8.5) high-nitrate (100 to 250 g/l) solutions at flow rates measured in bed volumes (BV's) of between 0.05 and 0.15 BV/min. The columns worked well until they became plugged by rusting after several hundred bed volumes of solution were flowed

through (330 to 900 BV). Similar tests using organic ion-exchange resins, such as Dowex SRB-OH and Reillex HP and Reillex HPQ, and the same alkaline high-nitrate solutions showed breakthroughs after 20 to 50 BV were passed.

905 Development of self-absorption coefficients for the determination of gamma-emitting radionuclides in environmental and mixed waste samples. Streets, W.E. (Analytical Chemistry Laboratory, Chemical Technology Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439 (United States)). *Nuclear Instruments and Methods in Physics Research, Section A*; 353(1-3): 702-705 (30 Dec 1994). (CONF-940524-: 8. symposium on radiation measurements and applications, Ann Arbor, MI (United States), 16-19 May 1994).

In gamma spectrometry the use of theoretical self-absorption coefficients (SACs) can eliminate the need to determine the SAC empirically by counting a known source through each sample. Models have been developed to estimate self-absorption corrections for the determination of non-specified gamma-emitting radionuclides in environmental and mixed waste samples of unknown, widely varying compositions. ((orig.))

906 Practical reporting times for environmental samples. Bayne, C.K. (Oak Ridge National Lab., TN (United States)); Schmoyer, D.D.; Jenkins, R.A. *Environmental Science and Technology*; 28(8): 1430-1436 (Aug 1994). DOE Contract AC05-84OR21400.

A new preanalytical holding-time approach called "practical reporting time" (PRT) has been developed that depends on the probability of an analyte measurement being below a critical concentration. This new approach has been applied to 19 volatile organic compounds and four explosives in both water and soil matrices. Practical reporting times for these analytes are used to develop a nomograph to show the consequences of chemically analyzing environmental samples past their PRT. This nomograph can be applied to a large class of analytes that uses zero-order or first-order kinetic models to approximate the degradation of analyte concentrations. 14 refs., 6 figs., 5 tabs.

907 Characterization of insoluble fractions of TNT transformed by composting. Caton, J.E. (Oak Ridge National Lab., TN (United States)); Ho, C.H.; Williams, R.T.; Griest, W.H. *Journal of Environmental Science and Health, Part A: Environmental Science and Engineering (United States)*; 29(4): 659-670 (May 1994). DOE Contract AC05-84OR21400. Grant 016-B123-A1; Grant DAAA15-88-D-0010.

Soil contaminated with explosives was supplemented with carbon-14 labelled 2,4,6-trinitrotoluene (^{14}C -TNT) and was composted in a field static pile composting experiment. After 90 d of composting, the distribution of carbon-14 (^{14}C) activity in fractions from acetonitrile extraction ("free" fraction, 1.2% of the initial ^{14}C -activity) and filtration ("insoluble-particle" fraction, 17.9%), alkaline hydrolysis ("insoluble-hydrolyzable" fraction, 56.8%), and combustion of the residue ("insoluble-nonhydrolyzable" fraction, 4.7%) showed that the bulk of the ^{14}C -activity, and presumably transformed product(s) of the ^{14}C -TNT, accumulated in a nonextractable, but hydrolyzable fraction. Repetitive aqueous leaching of the compost and also ultraviolet light irradiation followed by leaching suggest that the insoluble fraction of transformed TNT should not be released appreciably by the action of acid rain or sunlight. 16 refs., 11 figs., 2 tabs.

908 The removal of alkanes in a liquid-continuous gas-phase bioreactor: Preliminary considerations. Davison, B.H. (Oak Ridge National Lab., TN (United States)); Thompson, J.E. *Applied Biochemistry and Biotechnology (United States)*; 45-46: 917-923 (Spr 1994). DOE Contract AC05-84OR21400.

Columnar bioreactors are being tested for the treatment of volatile organics. The bioreactors contain microorganisms that are able to remove and degrade the dilute gaseous hydrocarbons (n-pentane and isobutane) from effluent air streams by biological action. Columnar bioreactors, including a liquid continuous packed column, were continuously operated for over 18 mo with sustained degradation of the gaseous hydrocarbons. In these systems, the hydrocarbons pentane and isobutane are the sole carbon and energy sources for the microbes. The overall conversion rate was increased by operating at higher gas flow rates. This indicates the importance of improving mass transfer and gas contact in these systems. 6 refs., 4 figs.

909 Risk assessments of innovative technologies for treatment of mixed waste. Ragaini, R.C. (Lawrence Livermore National Lab., CA (United States)); Aycock, M.T.; Russell, J.E. *Transactions of the American Nuclear Society (United States)*; 69: 51-52 (1993). (CONF-931160-: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

The mission of the US Department of Energy's (DOE's) Mixed Waste Integrated Program (MWIP) is to develop complete and appropriate technologies for the treatment of DOE mixed low-level waste and transuranic wastes in order to ensure that all affected DOE installations and projects can come into compliance with environmental law and meet DOE's 30-yr cleanup and operational goals. The MWIP will achieve its goal by developing technologies that are in compliance with regulatory requirements, are socially and politically viable, and are cost beneficial and effective in disposed waste source term and volume reduction. The project management plan for MWIP requires that technologies be evaluated in accordance with criteria that rank technologies with regard to performance, risk, and cost-effectiveness. This paper addresses the methodology used to rank alternative mixed-water treatment technologies with regard to relative risk.

910 Biodegradation of chlorinated aliphatic hydrocarbon mixtures in a single-pass packed-bed reactor. Lackey, L.W. (Univ. of Tennessee, Knoxville, TN (United States)); Bienkowski, P.R.; Phelps, T.J.; White, D.C. *Applied Biochemistry and Biotechnology (United States)*; 39-40: 701-713 (Spr 1993).

Aliphatic chlorinated compounds, such as trichloroethylene (TCE) and tetrachloroethylene (PCE), are major contaminants of ground water. A single-pass packed-bed bioreactor was utilized to study the biodegradation of organic waste mixtures consisting of PCE, TCE, and other short-chain chlorinated organics. The bioreactor consisted of two 1960-mL glass columns joined in a series. One column was packed with sand containing a microbial consortia enriched from a contaminated site. The other column provided a reservoir for oxygen and a carbon source of methane/propane that was recirculated through the reactor. Sampling was accomplished by both direct headspace and liquid effluent concentration analyses. The reactor was operated in a single-pass mode. Greater than 99% degradation of trichloroethylene, approaching drinking water standards, was observed when the bioreactor residence time ranged

from 1.9 to 3.2 d. Typically, when the reactor was pulse-fed with methane, propane, and air, 1 mol of TCE was degraded/110 mol of substrate utilized. Perturbation studies were performed to characterize reactor behavior. The system's degradation behavior was affected by providing different carbon sources, a pulse feeding regime, supplementing microbial biomass, and by altering flow rates. 28 refs., 3 figs., 5 tabs.

911 Intensified charge coupled device-based fiber-optic monitor for rapid remote surface-enhanced Raman scattering sensing. Alarie, J.P. (Oak Ridge National Lab., TN (United States)); Stokes, D.L.; Sutherland, W.S.; Edwards, A.C.; Vo-Dinh, T. *Applied Spectroscopy (United States)*; 46(11): 1608-1612 (Nov 1992). DOE Contract AC05-84OR21400; AC05-76OR00033.

This paper describes the development of an intensified charge coupled device (ICCD)-based fiber-optic monitor for remote Raman and surface-enhanced Raman (SERS) sensing. Both Raman and SERS data were obtained with the use of a fiber-optic probe design incorporating 20-m optical fibers carrying the Raman signal. Spectra were obtained in 5 milliseconds for Raman and 9 ms for SERS. The proposed system could be used for a highly sensitive portable Raman system for rapid and remote chemical sensing. 28 refs., 4 figs., 2 tabs.

912 The modeling process and model validation. Tsang, C.F. (Lawrence Berkeley Lab., CA (United States). Earth Science Div.). *Ground Water (United States)*; 29(6): 825-831 (Nov-Dec 1991). DOE Contract AC03-76SF00098.

The safety assessment of underground disposal of nuclear or toxic wastes requires the use of models. Such models need to be validated to ensure, as much as possible, that they are a good representation of the actual processes occurring in the real system. In this paper an attempt is made to take a broad view by reviewing step by step the modeling process and bringing out the need for validating every step of this process. Thus, model validation includes not only comparison of modeling results with data from selected experiments, but also evaluation of procedures for the construction of conceptual models and calculational models as well as methodologies for studying data and parameter correlation. The need for advancing basic scientific knowledge in related fields, for multiple assessment groups, and for presenting the modeling efforts in open literature for public scrutiny is also emphasized.

913 Waste treatment process for removal of contaminants from aqueous, mixed-waste solutions using sequential chemical treatment and crossflow microfiltration, followed by dewatering. Vijayan, S.; Wong, C.F.; Buckley, L.P. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,366,634/A. 22 Nov 1994. Filed date 26 Aug 1992. U.S. Patent Application 7-935,328. Int. Cl. C02F 9/00. [10p.] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

In processes of this invention aqueous waste solutions containing a variety of mixed waste contaminants are treated to remove the contaminants by a sequential addition of chemicals and adsorption/ion exchange powdered materials to remove the contaminants including lead, cadmium, uranium, cesium-137, strontium-85/90, trichloroethylene and benzene, and impurities including iron and calcium. Staged conditioning of the waste solution produces a polydisperse system of size enlarged complexes of the contaminants in

three distinct configurations: water-soluble metal complexes, insoluble metal precipitation complexes, and contaminant-bearing particles of ion exchange and adsorbent materials. The volume of the waste is reduced by separation of the polydisperse system by cross-flow microfiltration, followed by low-temperature evaporation and/or filter pressing. The water produced as filtrate is discharged if it meets a specified target water quality, or else the filtrate is recycled until the target is achieved. 1 fig.

HIGH-LEVEL WASTE TANK REMEDIATION

Refer also to citation(s) 161, 162, 166, 167, 171, 172, 173, 178, 179, 180, 204, 270, 291, 324, 396, 399, 720, 1712, 1839, 1854, 1869, 1878, 1897, 1900, 2306, 2308, 2312, 2328, 2331, 2334, 2345, 2355, 2526, 2529, 2532, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2913, 2914, 2915, 2918, 2920, 2921, 2923, 2924, 2925, 2926, 2930, 2931, 2932, 2933, 2935, 2937, 2946, 2949, 2950

914 (ANL/EWM/CP-82897) Engineering management of Underground Storage Tank upgrades and installations. Patel, P.B. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940853-2: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94015074. Source: OSTI; NTIS; GPO Dep.

Remediation of Leaking Underground Storage Tanks (LUST) is estimated to cost more than \$41 billion in the United States. As of May 1992, 1.5 million Underground Storage Tanks were registered in USA. By September 1992, 184,000 confirmed releases (leaks) were reported in USA. Due to such a vast impact on the environment due to leaking USTS, United States Environmental Protection Agency (USEPA) published final UST regulations in the Federal Register on September 23, 1988 (40CFR Part 280) which affected almost every commercial underground storage tank (UST). In a rush to comply with UST regulations, it is important that sufficient attention has been paid to engineering aspects of the work. Due to wide array of UST leak prevention and detection products available, selection of appropriate instrumentation can be time consuming. Most states have taken federal government standards on USTs and incorporated them as state regulations with their state specific modifications depending on their local geological conditions and environmental priorities. However, it is important to find out that state's UST program has been approved by USEPA. This paper consists of discussion of issues based on the author's UST project related experience from current and previous employment. Following are the major UST related regulatory topics discussed in this paper: Specifications; Hiring a contractor; Piping Selection and Installation; UST Selection and Installation; Leak Detection System Environmental Sampling.

915 (ANL/RE/CP-82146) SSI effects for a tank containing two liquids. Tang, Yu. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940613-12: 1994 pressure vessels and piping conference, Minneapolis, MN (United States), 19-23 Jun 1994). Order Number DE94012457. Source: OSTI; NTIS; INIS; GPO Dep.

Following a brief review of a mechanical model which permits consideration of the flexibility of the tank wall and the supporting medium, the effects of the soil-structure interaction on the dynamic response of a laterally excited tank that contains two liquids are examined. The quantities examined include the hydrodynamic pressure, base shear and moments. The results are compared with those obtained with no soil-structure interaction. Only the impulsive component of response is examined; the convective component is for all practical purposes unaffected by soil-structure interaction. It is shown that for the conditions considered, soil-structure interaction reduces the peak response of the tank-liquid system.

916 (ANL/RE/CP-82360) Sloshing roof impact tests of a rectangular tank. Minowa, C. (National Research Inst., for Earth Science and Disaster Prevention, Tusukuba, Ibaraki (Japan)); Ogawa, N.; Harada, I.; Ma, D.C. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940613-13: 1994 pressure vessels and piping conference, Minneapolis, MN (United States), 19-23 Jun 1994). Order Number DE94012462. Source: OSTI; NTIS; INIS; GPO Dep.

Some tanks have been damaged at the roofs due to sloshing impact caused by strong earthquakes. It is, therefore, necessary to consider the impact force in the aseismic design code for tank roofs. However, there are few studies on the earthquake responses of storage and process tank roofs. As a first step to investigate the effects of sloshing impact a series of the shaking table tests of a rectangular tank have been conducted at the National Research Institute for Earth Science and Disaster Prevention (NIED). The results of these shaking table tests are presented in the paper. The test tank is rectangular in shape having dimensions of 5 m x 3 m x 2 m length x width x height. The tank was constructed of glass-fiber reinforced plastic panels. Every panel had a flange on four edges, and each panel was connected by bolts along the flange. The test tank was set on the NIED shaking table (15 m by 15 m). Two types of liquid were used, water and a viscous liquid (water mixed with polymeric powders). The roof impact pressures and other quantities were measured. During the tests using the 400 pi El-Centro excitation, the roof deformation sensor steel beam was damaged. The response of side walls with different rigidity were measured in the wall bulging tests. The measured vibrations within the panel plates were larger than those in the panel flanges. The viscous liquid of 100 cp had little influence on wall bulging responses. However, the viscous effects on sloshing responses were observed in the sloshing tests. Approximate analyses of rectangular tanks, considering the influence of static water pressure, are also presented in this paper.

917 (BNL-52444) Dynamic modeling and response of rigid embedded cylinders. Veletsos, A.S.; Younan, A.H.; Bandyopadhyay, K. Brookhaven National Lab., Upton, NY (United States). Oct 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95006728. Source: OSTI; NTIS; INIS; GPO Dep.

Following a brief review of the limitations of a popular technique for modeling the soil action in analyses of the dynamic response of deeply embedded cylindrical foundations and structures, the sources of the limitations are identified and a modification is proposed which, while retaining the

attractiveness of the original model, defines correctly the action of the system. In the proposed approach, the soil medium is modeled by a series of elastically constrained, rather than unconstrained, thin horizontal layers with a circular hole at the center. The impedances of the constrained layers are established and are then used to evaluate the dynamic response of a rigid vertical cylinder embedded in a uniform viscoelastic stratum of constant thickness and infinite extent in the horizontal direction. The cylinder and the stratum are presumed to be supported on a non-deformable base undergoing a uniform horizontal motion. The effects of both harmonic and earthquake induced ground motions are considered. The response quantities examined include the dynamic force per unit of cylinder height and the corresponding base shear and base moment. The system investigated simulates the design of underground storage tanks at Hanford for the storage of radioactive wastes.

918 (CONF-930873-, pp. 1.1.1-1.1.11) The nitrate to ammonia and ceramic (NAC) process: A newly developed low-temperature technology. Mattus, A.J. (Oak Ridge National Lab., TN (United States)); Lee, D.D. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-top feasibility studies with Hanford single-shell tank (SST) simulants, using a new low-temperature (50-60°C) process for converting nitrate to ammonia and ceramic, have conclusively shown that between 90 and 99% of the nitrate at Hanford can be readily converted to ammonia. In this process, aluminum powders or shot can be used to convert alkaline, nitrate-based supernate to ammonia and an alumina-silica-based ceramic solid. The process may actually be able to utilize already contaminated aluminum scrap metal from various US DOE sites to effect the conversion. The final nitrate-free ceramic product can be calcined, pressed, and sintered like any other ceramic. Based upon the starting volumes of 6.2 and 3.1 M sodium nitrate solution (probable supernate concentrations resulting from salt-cake/sludge removal from the Hanford SSTs), volume reductions as high as 70% are currently obtained, compared with an expected 40 to 50% volume increase if the Hanford supernate were grouted. Engineering data extracted from bench-top studies indicate that the process will be very economical. These data were used to cost a batch facility with a production rate of 1200 kilograms of nitrate per hour for processing all the Hanford SST waste over 20 years. Our process cost analysis indicates that between \$2.01 and 2.66 will be required to convert each kilogram of nitrate. Based upon 1957 literature, these costs are one-third to one-half of the processing costs quoted for electrolytic and thermal processes.

919 (CONF-930873-, pp. 13.1.1-13.1.10) Treatment of aqueous mixed wastes containing RCRA metals. No, H. (Argonne National Lab., IL (United States)); Wygmans, D.G.; Chamberlain, D.B.; Connor, C.; Hutter, J.C.; Srinivasan, C.; Leonard, R.A.; Nunez, L.; Sedlet, J.; Vandegrift, G.F. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20

Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

A treatment process was developed for liquid radioactive mixed wastes containing hazardous metals and/or acids and bases. The process uses precipitation/pH adjustment with calcium hydroxide followed by precipitation with sodium sulfide. The resulting slurry is then filtered to remove the hazardous metal precipitates, and the resulting nonhazardous filtrate volume is reduced by evaporation. The performance of the process was determined on the lab. scale; a design of the pilot-scale process was completed; and a process control strategy that uses on-line control of both pH and sulfide was developed. Results from the lab. scale testing on various mixed wastes are reported.

920 (CONF-940815-1) **Environmental Restoration and Waste Management Technology Development projects supporting tank waste processing and disposal.** McGinnis, C.P. (Oak Ridge National Lab., TN (United States)); Hunt, R.D.; Cruse, J.M. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94009172. Source: OSTI; NTIS; INIS; GPO Dep.

Production of nuclear materials has been a major mission of the US Department of Energy (DOE) and predecessor agencies for the last 50 years. The production processes such as PUREX, REDOX, and bismuth phosphate separations have generated 1×10^6 gal of radioactive waste. The waste is currently stored in more than 300 underground storage tanks (USTs) at Hanford, Savannah River, Oak Ridge, and Idaho. The waste in a typical UST is partitioned into three aqueous phases: saltcake, supernate, and sludge. Approximately half of the waste inventory is composed of sodium nitrate and nitrites. The radioactivity of the waste, 1×10^{11} Bq/L is primarily due to ^{137}Cs and ^{90}Sr . Major inorganic species result from aluminum nitrate and concentrated nitric acid that was used for metallic dissolution and from ferrocyanide that was used for cesium removal. Organic chemicals that were used in large amounts during plutonium production and subsequent waste stabilization are concerns from safety and processing standpoints. Prior to storage at Hanford, Savannah River, and Oak Ridge, the pH of the waste was adjusted to 10-14 with the addition of NaOH. DOE has made a commitment to retrieve the waste from the USTs that are not in compliance with state and federal regulations and to treat and dispose of the wastes in accordance with accepted practice. The cost of UST remediation is prohibitive using some of the current baseline technologies. Furthermore, major gaps exist in key technology areas for processing and disposal of the waste. This DOE remediation effort is one of the most complex and resource-intensive clean-up actions ever attempted by a government agency.

921 (CONF-940815-48) **The chemistry, waste form development, and properties of the Nitrate to Ammonia and Ceramic (NAC) process.** Mattus, A.J.; Lee, D.D.; Youngblood, E.L.; Walker, J.F. Jr.; Tiegs, T.N. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94014018. Source: OSTI; NTIS; INIS; GPO Dep.

A process for the conversion of alkaline, aqueous nitrate wastes to ammonia gas at low temperature, based upon the use of the active metal reductant aluminum, has been developed at the Oak Ridge National Laboratory (ORNL). The process is also well suited for the removal of low-level waste (LLW) radioelements and hazardous metals which report to the solid, alumina-based by-product. The chemistry of the interaction of aluminum powders with nitrate, and other waste stream metals is presented.

922 (CONF-940815-110) **An experimental investigation of the thermal/fluid properties of the nitrate to ammonia and ceramic (NAC) product slurry.** Muguercia, I. (Florida International Univ., Miami, FL (United States). Dept. of Mechanical Engineering); Lagos, L.; Yang, G.; Li, W.; Ebadian, M.A.; Mattus, A.J.; Lee, D.D.; Walker, J.W.; Hunt, R.D. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). Grant 19X-SN855C. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE95007023. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, a new immobilization technique for LLW, the Nitrate to Ammonia and Ceramic (NAC) process, has been developed. Instead of mixing the liquid waste form directly with the cement to make concrete blocks, the NAC process eliminates the nitrate from the LLW by converting it to ammonia gas. Aluminum particles are used as a reductant to complete this conversion. The final product of the NAC process is gibbsite, which can be further sintered to a ceramic waste form. Experimental tests are conducted to measure the apparent viscosity, the pressure drop, and the heat transfer coefficient of the pipe flow of the Nitrate to Ammonia and Ceramic (NAC) process product slurry. The tests indicate that the NAC product slurry exhibits a typical pseudoplastic fluid behavior. The pressure drop in the pipe flow is a function of the Reynolds number and the slurry temperature. The results also indicate that at a low slurry temperature, the slurry is uniformly heated peripherally. At a high slurry temperature, however, the slurry may be thermally stratified. In a straight pipe, the Nusselt number is reduced as the slurry temperature increases.

923 (CONF-9408136-3) **Telerobotic excavation system for unexploded ordnance retrieval.** Burks, B.L. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Killough, S.M.; Thompson, D.H.; Rossi, R.A. Oak Ridge National Lab., TN (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 26. Department of Defense explosives safety seminar; Miami, FL (United States); 16-18 Aug 1994. Order Number DE95006738. Source: OSTI; NTIS; GPO Dep.

The small emplacement excavator (SEE) is a ruggedized military vehicle with backhoe and front loader used by the US Army for unexploded ordnance (UXO) retrieval and general utility excavation activities. In order to evaluate the feasibility of removing personnel from the vehicle during high-risk excavation tasks a development and demonstration project was initiated to evaluate performance capabilities of the SEE under telerobotic control. A technology demonstration of the TSEE was conducted at McKinley Range, Redstone Arsenal, Huntsville, Alabama on 13-17 September, 1993. The primary objective of the demonstration was to evaluate and demonstrate the feasibility of remote UXO retrieval. During the demonstration, explosive ordnance disposal specialists were instructed on telerobotic

operation of the TSEE, and then were asked to complete a simulated UXO retrieval task. Participants then submitted an evaluation of the system including human factors performance data. This presentation will describe the TSEE, retrieval demonstration, and summarize results of the performance evaluations. Some examples of the results are given below. Seventy percent of the demonstration participants found the tasks were as easy or easier to accomplish utilizing the remote system than with an unmodified system. Similarly, eighty percent of the participants found the TSEE hand controller was as easy or easier to use than the normal manual controls.

924 (DOE/EM-0177-Vol.1) High-level waste borosilicate glass a compendium of corrosion characteristics: Volume 1. Cunnane, J.C. (comp.) (Argonne National Lab., IL (United States)); Bates, J.K.; Bradley, C.R. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). High-Level Waste Div. Mar 1994. 149p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016636. Source: OSTI; NTIS; INIS; GPO Dep.

Current plans call for the United States Department of Energy (DOE) to start up facilities for vitrification of high-level radioactive waste (HLW) stored in tanks at the Savannah River Site, Aiken, South Carolina, in 1995; West Valley Demonstration Project, West Valley, New York, in 1996; and at the Hanford Site, Richland, Washington, after the year 2000. The product from these facilities will be canistered HLW borosilicate glass, which will be stored, transported, and eventually disposed of in a geologic repository. The behavior of this glass waste product, under the range of likely service conditions, is the subject of considerable scientific and public interest. Over the past few decades, a large body of scientific information on borosilicate waste glass has been generated worldwide. The intent of this document is to consolidate information pertaining to our current understanding of waste glass corrosion behavior and radionuclide release. The objective, scope, and organization of the document are discussed in Section 1.1, and an overview of borosilicate glass corrosion is provided in Section 1.2. The history of glass as a waste form and the international experience with waste glass are summarized in Sections 1.3 and 1.4, respectively.

925 (DOE/EM-0177-Vol.2) High-level waste borosilicate glass: A compendium of corrosion characteristics: Volume 2. Cunnane, J.C. (comp.) (Argonne National Lab., IL (United States)); Bates, J.K.; Bradley, C.R. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). High-Level Waste Div. Mar 1994. 350p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016637. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this document is to summarize scientific information pertinent to evaluating the extent to which high-level waste borosilicate glass corrosion and the associated radionuclide release processes are understood for the range of environmental conditions to which waste glass may be exposed in service. Alteration processes occurring within the bulk of the glass (e.g., devitrification and radiation-induced changes) are discussed insofar as they affect glass corrosion. This document is organized into three volumes. Volumes I and II represent a tiered set of information intended for somewhat different audiences. Volume I is intended to provide an overview of waste glass corrosion, and Volume II is intended to provide additional experimental

details on experimental factors that influence waste glass corrosion. Volume III contains a bibliography of glass corrosion studies, including studies that are not cited in Volumes I and II. Volume I is intended for managers, decision makers, and modelers, the combined set of Volumes I, II, and III is intended for scientists and engineers working in the field of high-level waste.

926 (DOE/EM-0177-Vol.3) High-level waste borosilicate glass: A compendium of corrosion characteristics: Volume 3. Cunnane, J.C. (comp.) (Argonne National Lab., IL (United States)); Bates, J.K.; Bradley, C.R. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). High-Level Waste Div. Mar 1994. 182p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016638. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this document is to summarize scientific information pertinent to evaluating the extent to which high-level waste borosilicate glass corrosion and the associated radionuclide release processes are understood for the range of environmental conditions to which waste glass may be exposed in service. Alteration processes occurring within the bulk of the glass (e.g., devitrification and radiation-induced changes) are discussed insofar as they affect glass corrosion. Volume III contains a bibliography of glass corrosion studies, including studies that are not cited in Volumes I and II.

927 (DOE/RL-94-52) High-activity liquid packaging design criteria. USDOE Richland Operations Office, WA (United States). May 1994. 15p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018165. Source: OSTI; NTIS; INIS; GPO Dep.

In recent studies, it has been acknowledged that there is an emerging need for packaging to transport high-activity liquid off the Hanford Site to support characterization and process development activities of liquid waste stored in underground tanks. These studies have dealt with specimen testing needs primarily at the Hanford Site; however, similar needs appear to be developing at other US Department of Energy (DOE) sites. The need to ship single and multiple specimens to offsite laboratories is anticipated because it is predicted that onsite laboratories will be overwhelmed by an increasing number and size (volume) of samples. Potentially, the specimen size could range from 250 mL to greater than 50 L. Presently, no certified Type-B packagings are available for transport of high-activity liquid radioactive specimens in sizes to support Site missions.

928 (EGG-WTD-11310) Maintenance study for W-340 Waste Retrieval System. Christensen, C.; Conner, C.C.; Sekot, J.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015294. Source: OSTI; NTIS; INIS; GPO Dep.

This study was performed to identify attributes and maintainability requirements for the Tank Waste Retrieval System (TWRS). The system will be developed for Westinghouse Hanford Company in Richland, Washington, as an integrated system to perform waste removal in Tank C-106 and, thus, demonstrate technologies for tank remediation that will satisfy requirements of the Tri-Party Agreement. The study examines attributes of the TWRS, scope of maintenance operations required for the TWRS, maintenance requirements, and potential methods of performing maintenance functions.

Recommendations are provided for consideration in the development of both the conceptual design and performance specification, which will be used in procuring the W-340 Waste Retrieval System.

929 (EGG-WTD-11311) Decontamination system study for the Tank Waste Retrieval System. Reutzel, T.; Manhardt, J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015293. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the findings of the Idaho National Engineering Laboratory's decontamination study in support of the Tank Waste Retrieval System (TWRS) development program. Problems associated with waste stored in existing single shell tanks are discussed as well as the justification for the TWRS program. The TWRS requires a decontamination system. The subsystems of the TWRS are discussed, and a list of assumptions pertinent to the TWRS decontamination system were developed. This information was used to develop the functional and operational requirements of the TWRS decontamination system. The requirements were combined with a comprehensive review of currently available decontamination techniques to produce a set of evaluation criteria. The cleaning technologies and techniques were evaluated, and the CO₂ blasting decontamination technique was chosen as the best technology for the TWRS.

930 (HLW-OVP-94-0005) HLW system plan - revision 2. Westinghouse Savannah River Co., Aiken, SC (United States). 14 Jan 1994. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94016435. Source: OSTI; NTIS; INIS; GPO Dep.

The projected ability of the Tank Farm to support DWPF startup and continued operation has diminished somewhat since revision 1 of this Plan. The 13 month delay in DWPF startup, which actually helps the Tank Farm condition in the near term, was more than offset by the 9 month delay in ITP startup, the delay in the Evaporator startups and the reduction to Waste Removal funding. This Plan does, however, describe a viable operating strategy for the success of the HLW System and Mission, albeit with less contingency and operating flexibility than in the past. HLWM has focused resources from within the division on five near term programs: The three evaporator restarts, DWPF melter heatup and completion of the ITP outage. The 1H Evaporator was restarted 12/28/93 after a 9 month shutdown for an extensive Conduct of Operations upgrade. The 2F and 2H Evaporators are scheduled to restart 3/94 and 4/94, respectively. The RHLWE startup remains 11/17/97.

931 (LA-12654-Rev.) Distributions of 14 elements on 63 absorbers from three simulant solutions (acid-dissolved sludge, acidified supernate, and alkaline supernate) for Hanford HLW Tank 102-SY. Marsh, S.F. (Sandia National Labs., Albuquerque, NM (United States)); Svitra, Z.V.; Bowen, S.M. Los Alamos National Lab., NM (United States). Aug 1994. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94017687. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Hanford Tank Waste Remediation System program at Los Alamos, we evaluated 63 commercially available or experimental absorber materials for their ability to remove hazardous components from high-level waste

(HLW). These absorbers included cation and anion exchange resins, inorganic exchangers, composite absorbers, and a series of liquid extractants sorbed on porous support-beads. We tested these absorbers with three solutions prepared to simulate acid-dissolved sludge (pH 0.6), acidified supernate (pH 3.5), and alkaline supernate (pH 13.9) from underground storage tank 102-SY at the Hanford Reservation near Richland, Washington. To these simulants we added the appropriate radionuclides and used gamma spectrometry to measure fission products (Ce, Cs, Sr, Tc, and Y), actinides (U, Pu, and Am), and matrix elements (Cr, Co, Fe, Mn, Zn, and Zr). For each of more than 2500 element/absorber/solution combinations, we measured distribution coefficients for dynamic contact periods of 30 min, 2 h, and 6 h to obtain information about sorption kinetics. Because we measured the sorption of many different elements, the tabulated results indicate those elements most likely to interfere with the sorption of elements of greater interest. On the basis of nearly 7500 measured distribution coefficients, we determined that many of these absorbers appear suitable for processing HLW. This study supersedes the previous version of LA-12654, in which results attributed to a solution identified as an alkaline supernate simulant were misleading because that solution contained insufficient hydroxide.

932 (LA-12863) Distributions of 15 elements on 58 absorbers from simulated Hanford Double-Shell Slurry Feed (DSSF). Marsh, S.F. (Sandia National Labs., Albuquerque, NM (United States)); Svitra, Z.V.; Bowen, S.M. Los Alamos National Lab., NM (United States). Nov 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005652. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Hanford Tank Waste Remediation System program at Los Alamos, we evaluated 58 commercially available or experimental absorber materials for their ability to remove hazardous components from high-level waste. These absorbers included cation and anion exchange resins, inorganic exchangers, composite absorbers, pillared layered materials, and a series of liquid extractants sorbed on porous support-beads. We tested these absorbers with a solution that simulates Hanford double-shell slurry feed (DSSF) (pH 14.0). To this simulant solution we added the appropriate radionuclides and used gamma spectrometry to measure fission products (Ce, Cs, Sr, Tc, and Y), actinides (U and Am), and matrix elements (Cr, Co, Fe, Mn, Ni, V, Zn, and Zr). For each of 870 element/absorber combinations, we measured distribution coefficients for dynamic contact periods of 30 min, 2 h, and 6 h to obtain information about sorption kinetics. On the basis of these 2610 measured distribution coefficients, we determined that many of the tested absorbers may be suitable for processing DSSF solutions.

933 (LA-12889) Distributions of 12 elements on 64 absorbers from simulated Hanford Neutralized Current Acid Waste (NCAW). Svitra, Z.V. (Los Alamos National Lab., NM (United States)); Bowen, S.M.; Marsh, S.F. Los Alamos National Lab., NM (United States). Dec 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005651. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Hanford Tank Waste Remediation System program at Los Alamos, we evaluated 64 commercially available or experimental absorber materials for their ability to remove hazardous components from high-level waste. These absorbers included cation and anion exchange resins, inorganic exchangers, composite absorbers, and a

series of liquid extractants sorbed on porous support-beads. We tested these absorbers with a solution that simulates Hanford neutralized current acid waste (NCAW) (pH 14.2). To this simulant solution we added the appropriate radionuclides and used gamma spectrometry to measure fission products (Cs, Sr, Tc, and Y) and matrix elements (Cr, Co, Fe, Mn, Ni, V, Zn, and Zr). For each of 768 element/absorber combinations, we measured distribution coefficients for dynamic contact periods of 30 min, 2 h, and 6 h to obtain information about sorption kinetics. On the basis of these 2304 measured distribution coefficients, we determined that many of the tested absorbers may be suitable for processing NCAW solutions.

934 (LA-SUB-95-7) Hanford Tank Farm Interim storage phase probabilistic risk assessment outline. Los Alamos National Lab., NM (United States); PLG, Inc., Washington, DC (United States). 19 May 1994. 226p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Subcontract 6617K0013-95. Order Number DE95005734. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the second in a series examining the risks for the high level waste (HLW) storage facilities at the Hanford Site. The first phase of the HTF PSA effort addressed risks from Tank 101-SY, only. Tank 101-SY was selected as the initial focus of the PSA because of its propensity to periodically release (burp) a mixture of flammable and toxic gases. This report expands the evaluation of Tank 101-SY to all 177 storage tanks. The 177 tanks are arranged into 18 farms and contain the HLW accumulated over 50 years of weapons material production work. A centerpiece of the remediation activity is the effort toward developing a permanent method for disposing of the HLW tank's highly radioactive contents. One approach to risk based prioritization is to perform a PSA for the whole HLW tank farm complex to identify the highest risk tanks so that remediation planners and managers will have a more rational basis for allocating limited funds to the more critical areas. Section 3 presents the qualitative identification of generic initiators that could threaten to produce releases from one or more tanks. In section 4 a detailed accident sequence model is developed for each initiating event group. Section 5 defines the release categories to which the scenarios are assigned in the accident sequence model and presents analyses of the airborne and liquid source terms resulting from different release scenarios. The conditional consequences measured by worker or public exposure to radionuclides or hazardous chemicals and economic costs of cleanup and repair are analyzed in section 6. The results from all the previous sections are integrated to produce unconditional risk curves in frequency of exceedance format.

935 (LA-SUB-95-35) Reliability analysis and design guidelines for the 101SY VDTT vent header flow and dome/vent header pressure measurement trip circuitry. Final draft. Clark, J. (Science and Engineering Associates, Inc., Albuquerque, NM (United States)); Rao, D.V.; Darby, J. Los Alamos National Lab., NM (United States). 9 Dec 1993. 1320p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. LANL-Subcontract-9-X50-8194N-1. Order Number DE95010801. Source: OSTI; NTIS; INIS; GPO Dep.

SEA has performed a reliability study and proposed design and operation guidelines in order to allow the VDTT flow circuit to be energized during 101SY mixing pump operation. The proposed/analyzed circuits are separate and

independent from the DACS circuitry, with the possible exception of sharing common sensors, signal splatters, and power supplies. In addition, SEA has studied and modeled the probability of a wasteberg impact with the VDTT given random probability distributions of both the center of mass of the berg, as well as the location of the burp. Depending upon the method used to evaluate (numerical integration or Monte Carlo sampling), the numbers range from 0.04 to 0.07. As a result, the most conservative number, 0.07 was used. Details of the calculations are included as Appendix A in this report. The proposed circuit design in its analyzed configuration considered independent inputs from 2 separate vent header flow sensors, the single dome pressure sensor, and a single vent header pressure sensor. This results in a total of 4 independent inputs which utilize a differentiator to sense increases or decreases in pressure or flows. A simplified block diagram of the proposed circuit is included as part of this report. In addition, the fault trees, significant event data quantification, failure to trip VDTT circuit event tree, and resulting dominant cutsets are included. Our results indicate that the conditional point estimate probability of failure to interrupt power to the VDTT flow circuit using the above defined circuit is 1.4×10^{-4} . This quantification is based upon a single 4 hour operation of the pump in a 24 hour period.

936 (LA-UR-94-1658) An analysis of alternative New Technical Strategy flowsheets for tank waste remediation system. Booker, C.P. Los Alamos National Lab., NM (United States). [1994]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94013001. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Tank remediation plans have gone through a few revisions for the best waste processing system. Some designs have been complex while others have been fairly simple. One of the key means in understanding and selecting among the various proposed systems is a discrete events modeling of the system. This modeling provides insight into (1) The total required size of the system; (2) The amount of material, such as reagents and other added materials that must be supplied; (3) The final mass of waste that must be stored; and (4) Areas within the system where a small change can greatly effect the total system. Discrete events modeling also provides the means by which various proposed systems may be compared. It is the framework in which variations within a particular system may be explored and compared to other instantiations. This study examines the current New Technical Strategy flowsheet system with discrete event modeling. Some of the possible variations within that system are examined and compared. Further, an previously proposed, more complex system is examined.

937 (LA-UR-94-1703) Rheological characterization of nuclear waste using falling-ball rheometry. Abbott, J.R.; Unal, C.; Stephens, T.; Pasamehmetoglu, K.O.; Graham, A.L.; Edwards, J.N. Los Alamos National Lab., NM (United States). [1994]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-6: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE94014812. Source: OSTI; NTIS; INIS; GPO Dep.

Knowledge of the rheological properties of saturated solutions containing solid particles is very important in nuclear waste management technology. For example, the nuclear waste in the Hanford Site high-level radioactive waste tanks

contains strong electrolyte solutions with a high concentration of solids. Previous attempt using rotational viscometers to determine the rheology has shown unusual thixotropic and shear thinning behaviors with a lack of reproducibility. Using falling-ball rheometry, the rheology of the undisturbed simulant may be determined with much better reproducibility. In this study, a well-mixed simulant which has similar chemical composition to the actual waste will be tested. Falling-ball size and density will be varied to get data in a wide range of shear rates. To determine the rheogram, several methods will be tried to match the observed data. Based on these tests, a rheogram can be determined from the model and its best-fit parameters. The simulant shows shear-thinning behavior and a yield stress. This would suggest a H-B model. But when fitting to one of the simulants which showed a very low yield stress, the predictions assuming no yield and assuming yield resulted in no improvement in the fit when assuming yield.

938 (LA-UR-94-2016) Challenges and methodology for safety analysis of a high-level waste tank with large periodic releases of flammable gas. Edwards, J.N. (Los Alamos National Lab., NM (United States)); Pasamehmetoglu, K.O.; White, J.R.; Stewart, C.W. Los Alamos National Lab., NM (United States). [1994]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-5: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE94014295. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-SY-101, located at the Department of Energy Hanford Site, has periodically released up to 10,000 ft³ of flammable gas. This release has been one of the highest-priority DOE operational safety problems. The gases include hydrogen and ammonia (fuels) and nitrous oxide (oxidizer). There have been many opinions regarding the controlling mechanisms for these releases, but demonstrating an adequate understanding of the problem, selecting a mitigation methodology, and preparing the safety analysis have presented numerous new challenges. The mitigation method selected for the tank was to install a pump that would mix the tank contents and eliminate the sludge layer believed to be responsible for the gas retention and periodic releases. This report will describe the principal analysis methodologies used to prepare the safety assessment for the installation and operation of the pump, and because this activity has been completed, it will describe the results of pump operation.

939 (LA-UR-94-2017) Hanford gas dispersion analysis. Fujita, R.K.; Travis, J.R. Los Alamos National Lab., NM (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-4: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE94014294. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis was performed to verify the design of a waste gas exhaustor for use in support of rotary core sampling activities at the Westinghouse Hanford Waste Tank Farm. The exhaustor was designed to remove waste gases from waste storage tanks during the rotary core drilling process of the solid materials in the tank. Some of the waste gases potentially are very hazardous and must be monitored during the exhaustor's operation. If the toxic gas concentrations in specific areas near the exhaustor exceed minimum Threshold Limit Values (TLVs), personnel must be excluded from the

area. The exhaustor stack height is of interest because an increase in stack height will alter the gas concentrations at the critical locations. The exhaust stack is currently ~4.6 m (15 ft) high. An equipment operator will be located within a 6.1 m (20 ft) radius of the exhaust stack, and his/her head will be at an elevation 3.7 m (12 ft) above ground level (AGL). Therefore, the maximum exhaust gas concentrations at this location must be below the TLV for the toxic gases. Also, the gas concentrations must be within the TLV at a 61 m (200 ft) radius from the stack. If the calculated gas concentrations are above the TLV, where the operator is working below the stack at the 61 m (200 ft) radius location, the stack height may need to be increased.

940 (LA-UR-94-2018) Waste gas combustion in a Hanford radioactive waste tank. Travis, J.R.; Fujita, R.K.; Spore, J.W. Los Alamos National Lab., NM (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-3: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE94014290. Source: OSTI; NTIS; INIS; GPO Dep.

It has been observed that a high-level radioactive waste tank generates quantities of hydrogen, ammonia, nitrous oxide, and nitrogen that are potentially well within flammability limits. These gases are produced from chemical and nuclear decay reactions in a slurry of radioactive waste materials. Significant amounts of combustible and reactant gases accumulate in the waste over a 110- to 120-d period. The slurry becomes Taylor unstable owing to the buoyancy of the gases trapped in a matrix of sodium nitrate and nitrite salts. As the contents of the tank roll over, the generated waste gases rupture through the waste material surface, allowing the gases to be transported and mixed with air in the cover-gas space in the dome of the tank. An ignition source is postulated in the dome space where the waste gases combust in the presence of air resulting in pressure and temperature loadings on the double-walled waste tank. This analysis is conducted with hydrogen mixing studies HMS, a three-dimensional, time-dependent fluid dynamics code coupled with finite-rate chemical kinetics. The waste tank has a ventilation system designed to maintain a slight negative gage pressure during normal operation. We modeled the ventilation system with the transient reactor analysis code (TRAC), and we coupled these two best-estimate accident analysis computer codes to model the ventilation system response to pressures and temperatures generated by the hydrogen and ammonia combustion.

941 (LA-UR-94-2019) Evaluating detonation possibilities in a Hanford radioactive waste tank. Travis, J.R. (Los Alamos National Lab., NM (United States)); Fujita, R.K.; Ross, M.C.; Edwards, J.N.; Shepherd, J.E. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931160-45: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94014291. Source: OSTI; NTIS; INIS; GPO Dep.

Since the early 1940s, radioactive wastes generated from the defense operations at the Hanford Site have been stored in underground waste storage tanks. During the intervening years, the waste products in some of these tanks have transformed into a potentially hazardous mixture of gases and solids as a result of radiolytic and thermal chemical reactions. One tank in particular, Tank 101-SY, has been periodically releasing high concentrations of a hydrogen/nitrous

oxide/nitrogen/ammonia gas mixture into the tank dome vapor space. There are concerns that under certain conditions a detonation of the flammable gas mixture may occur. There are two ways that a detonation can occur during a release of waste gases into the dome vapor space: (1) direct initiation of detonation by a powerful ignition source, and (2) deflagration to detonation transition (DDT). The first case involves a strong ignition source of high energy, high power, or of large size (roughly 1 g of high explosive (4.6 kJ) for a stoichiometric hydrogen-air mixture¹) to directly initiate a detonation by "shock" initiation. This strong ignition is thought to be incredible for in-tank ignition sources. The second process involves igniting the released waste gases, which results in a subsonic flame (deflagration) propagating into the unburned combustible gas. The flame accelerates to velocities that cause compression waves to form in front of the deflagration combustion wave. Shock waves may form, and the combustion process may transition to a detonation wave.

942 (LA-UR-94-2544) New challenges in the safety analysis of DOE's high-level waste tanks. Edwards, J.N. (Los Alamos National Lab., NM (United States). Technology and Safety Assessment Div.); Pasamehmetoglu, K.O.; White, J.R. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409178-4; American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE94018089. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-SY-101, located at the Department of Energy Hanford Site, has periodically released up to 283 m³ (10,000 ft³) of flammable gas. This release has been one of the highest priority DOE operational safety problems because of potential consequences if the gas were ignited during one of these releases. The gases include hydrogen and ammonia (fuels) and nitrous oxide (oxidizer). There have been many opinions regarding the controlling mechanisms for these releases, but demonstrating an adequate understanding of the problem, selecting a mitigation methodology, and preparing the safety analysis have presented numerous new challenges. The purpose of this report is to present an overview of the problem, the main issues, the method selected to mitigate this hazard, and the results of the mitigation program.

943 (LA-UR-94-3077) An analysis of the New Technical Strategy Flowsheet applied to the watch list tanks. Booker, C.P. Los Alamos National Lab., NM (United States). 1 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95000872. Source: OSTI; NTIS; INIS; GPO Dep.

The New Technical Strategy Flowsheet is currently chosen for cleanup of the tanks on the Hanford Reservation. In this study, it is applied to a set of nine single shell tanks on the site. These tanks are considered to have a high potential for uncontrolled releases and have been placed on a watch list. Accordingly, it appears that any waste remediation strategy such as the New Technical Strategy Flowsheet might first be applied to these tanks.

944 (LA-UR-94-3195) Hydrothermal processing of Hanford tank wastes: Process modeling and control. Currier, R.P. (comp.). Los Alamos National Lab., NM (United States). [1994]. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95000912. Source: OSTI; NTIS; INIS; GPO Dep.

In the Los Alamos National Laboratory (LANL) hydrothermal process, waste streams are first pressurized and heated as they pass through a continuous flow tubular reactor vessel. The waste is maintained at reaction temperature of 300–550 °C where organic destruction and sludge reformation occur. This report documents LANL activities in process modeling and control undertaken in FY94 to support hydrothermal process development. Key issues discussed include non-ideal flow patterns (e.g. axial dispersion) and their effect on reactor performance, the use and interpretation of inert tracer experiments, and the use of computational fluid mechanics to evaluate novel hydrothermal reactor designs. In addition, the effects of axial dispersion (and simplifications to rate expressions) on the estimated kinetic parameters are explored by non-linear regression to experimental data. Safety-related calculations are reported which estimate the explosion limits of effluent gases and the fate of hydrogen as it passes through the reactor. Development and numerical solution of a generalized one-dimensional mathematical model is also summarized. The difficulties encountered in using commercially available software to correlate the behavior of high temperature, high pressure aqueous electrolyte mixtures are summarized. Finally, details of the control system and experiments conducted to empirically determine the system response are reported.

945 (LA-UR-94-3233) Hydrothermal processing of inorganic components of Hanford tank sludge. Oldenborg, R.; Buelow, S.J.; Dyer, R.B.; Anderson, G.; Dell'Orco, P.C.; Funk, K.; Wilmanns, E.; Knutsen, K. Los Alamos National Lab., NM (United States). Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95000937. Source: OSTI; NTIS; INIS; GPO Dep.

Hydrothermal Processing (HTP) is an attractive approach for the treatment of Hanford tank sludge. Hydrothermal Processing refers to a waste treatment technique in which an aqueous waste stream is fed through a chemical reactor at elevated temperatures and pressures to effect desired chemical transformations and separations. Transformations such as organic and nitrate destruction and sludge reformulation have been demonstrated at pilot scale using simulants of Hanford tank wastes. At sufficiently high temperatures and pressures organics and nitrates are destroyed in seconds, producing primarily simple products such as CO₃²⁻, H₂O, N₂, N₂O and OH⁻, and sludges are reduced in volume and reformulated as rapid settling oxides amenable to downstream separation, or in some cases reformulated as soluble products. This report describes the hydrothermal dissolution of chromium and chromium oxide; the hydrothermal oxidation of chromium with nitrate; hydrothermal dissolution of aluminum-bearing sludges; the solubility of aluminum compounds in caustic hydrothermal media; experimental techniques for the study of solubility and phase behavior; optical cell studies of basic aluminate solution solubilities; and high temperature, low density salt solubility in the packed-bed flow apparatus.

946 (LA-UR-94-3359) Reduction of nitrate and nitrite salts under hydrothermal conditions. Foy, B.R.; Dell'Orco, P.C.; Wilmanns, E.; McInroy, R.; Ely, J.; Robinson, J.M.; Buelow, S.J. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409237-1: 12. international conference on the properties of water and steam, Washington, DC (United

States), Sep 1994). Order Number DE95001020. Source: OSTI; NTIS; INIS; GPO Dep.

The feasibility of reducing nitrate/nitrite salts under hydrothermal conditions for the treatment of aqueous mixed wastes stored in the underground tanks at the Department of Energy site at Hanford, Washington was studied. The reduction of nitrate and nitrite salts by reaction with EDTA using a tank waste simulant was examined at temperatures between 623K and 800K and pressures between 0.6 and 1.2 kbar. Continuous flow reactors were used to determine kinetics and products of reactions. All reactions were studied under pressures high enough to produce single phase conditions. The reactions are rapid, go to completion in less than a minute, and produce simple products, such as carbonate, nitrogen, and nitrous oxide gases. The experimental results demonstrate the ability of chemical reactions under hydrothermal conditions to reduce the nitrate and nitrite salts and destroy organic compounds in the waste mixtures.

947 (LA-UR-94-3865) Consequence assessment for the high-level waste tanks probabilistic risk assessment. MacFarlane, D.R. (Los Alamos National Lab., NM (United States)); Kindinger, J.; Deremer, R.K. Los Alamos National Lab., NM (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9411156-1: International Atomic Energy Agency (IAEA) technical committee meeting, Vienna (Austria), 21-25 Nov 1994). Order Number DE95003698. Source: OSTI; NTIS; INIS; GPO Dep.

At the US DOE Hanford Site, there are 177 underground tanks in 18 separate tank farms containing accumulated liquid radioactive wastes from 50 yr of weapons materials production activities. The total volume is about 60 million gallons containing approximately 120 Curies of radioactivity. The radioactive material consists primarily of ^{137}Cs , ^{90}Sr , and transuranics. Risk concerns with the tanks are associated with possible energy releases because of the presence of flammable gases, organic liquids, reactive chemical compounds, and radioactive decay heat. Because of the high concentration of radioactivity in the wastes and because a large number of the older single-shell tanks have some history or evidence of leaking, there is a public perception that they pose a serious risk to the onsite workers and the offsite public. The tank farm probabilistic safety assessment (PSA) was performed for two reasons: (1) to develop a baseline estimate of the risks these wastes pose to the workers and the public for the present tank contents and configurations and (2) to provide a relative ranking of the risks associated with individual groups of tanks. The latter information would be helpful in planning the order of the tank remediation work by indicating which tanks pose the greatest risk; the former could help allay concerns.

948 (LA-UR-95-78) Retained gas sampler interim safety assessment. Pasamehmetoglu, K.O.; Miller, W.O.; Unal, C.; Fujita, R.K. Los Alamos National Lab., NM (United States). 13 Jan 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006335. Source: OSTI; NTIS; INIS; GPO Dep.

This safety assessment addresses the proposed action to install, operate, and remove a Retained Gas Sampler (RGS) in Tank 101-SY at Hanford. Purpose of the RGS is to help characterize the gas species retained in the tank waste; the information will be used to refine models that predict the gas-producing behavior of the waste tank. The RGS will take samples of the tank from top to bottom; these samples

will be analyzed for gas constituents. The proposed action is required as part of an evaluation of mitigation concepts for eliminating episodic gas releases that result in high hydrogen concentrations in the tank dome space.

949 (LA-UR-95-201) Modeling precipitation from concentrated solutions with the EQ3/6 chemical speciation codes. Brown, L.F.; Ebinger, M.H. Los Alamos National Lab., NM (United States). 13 Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-46: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006264. Source: OSTI; NTIS; GPO Dep.

One of the more important uncertainties of using chemical speciation codes to study dissolution and precipitation of compounds is the results of modeling which depends on the particular thermodynamic database being used. The authors goal is to investigate the effects of different thermodynamic databases on modeling precipitation from concentrated solutions. They used the EQ3/6 codes and the supplied databases to model precipitation in this paper. One aspect of this goal is to compare predictions of precipitation from ideal solutions to similar predictions from nonideal solutions. The largest thermodynamic databases available for use by EQ3/6 assume that solutions behave ideally. However, two databases exist that allow modeling nonideal solutions. The two databases are much less extensive than the ideal solution data, and they investigated the comparability of modeling ideal solutions and nonideal solutions. They defined four fundamental problems to test the EQ3/6 codes in concentrated solutions. Two problems precipitate $\text{Ca}(\text{OH})_2$ from solutions concentrated in Ca^{++} . One problem tests the precipitation of $\text{Ca}(\text{OH})_2$ from high ionic strength (high concentration) solutions that are low in the concentrations of precipitating species (Ca^{++} in this case). The fourth problem evaporates the supernatant of the problem with low concentrations of precipitating species. The specific problems are discussed.

950 (ORNL/ER-286) Technology study of Gunite tank sludge mobilization at Oak Ridge National Laboratory, Oak Ridge, Tennessee. DeVore, J.R.; Herrick, T.J.; Lott, K.E. Oak Ridge National Lab., TN (United States). Dec 1994. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005736. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory (ORNL) Gunite Tank Sludge Mobilization Technology Study was initiated to support the Gunite Tank Treatability Study effort. The technology study surveyed the methods and technologies available for tank cleaning and sludge mobilization in a radioactive environment. Technologies were identified and considered for applicability to the Gunite and Associated Tanks (GAAT) problems. These were then either accepted for further study or rejected as not applicable. Technologies deemed applicable to the GAAT sludge removal project were grouped for evaluation according to (1) deployment method, (2) types of remotely operated end effector equipment applicable to removal of sludge, (3) methods for removing wastes from the tanks, and (4) methods for concrete removal. There were three major groups of deployment technologies: "past practice" technologies, mechanical arm-based technologies, and vehicle-based technologies. The different technologies were then combined into logical sequences of deployment platform, problem, end effector, conveyance, post-removal treatment required (if any), and disposition of the waste. Many waste removal options are available, but the best

technology in one set of circumstances at one site might not be the best type to use at a different site. No single technology is capable of treating the entire spectrum of wastes that will be encountered in GAAT. None of the systems used in other industries appears to be suitable, primarily because of the nature of the sludges in the GAAT Operable Unit (OU), their radiation levels, and tank geometries. Other commercial technologies were investigated but rejected because the authors did not believe them to be applicable.

951 (ORNL/ER/Sub-87-99053/71) Potential radiological exposure rates resulting from hypothetical dome failure at Tank W-10. Oak Ridge National Lab., TN (United States). Jul 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019213. Source: OSTI; NTIS; INIS; GPO Dep.

The main plant area at Oak Ridge National Laboratory (ORNL) contains 12 buried Gunite tanks that were used for the storage and transfer of liquid radioactive waste. Although the tanks are no longer in use, they are known to contain some residual contaminated sludges and liquids. In the event of an accidental tank dome failure, however unlikely, the liquids, sludges, and radioactive contaminants within the tank walls themselves could create radiation fields and result in above-background exposures to workers nearby. This Technical Memorandum documents a series of calculations to estimate potential radiological exposure rates and total exposures to workers in the event of a hypothetical collapse of a Gunite tank dome. Calculations were performed specifically for tank W-10 because it contains the largest radioactivity inventory (approximately half of the total activity) of all the Gunite tanks. These calculations focus only on external, direct gamma exposures for prescribed, hypothetical exposure scenarios and do not address other possible tank failure modes or routes of exposure. The calculations were performed with established, point-kernel gamma ray modeling codes.

952 (ORNL/TM-12245) A low-temperature process for the denitration of Hanford single-shell tank, nitrate-based waste utilizing the nitrate to ammonia and ceramic (NAC) process. Mattus, A.J.; Lee, D.D.; Dillow, T.A.; Farr, L.L.; Lohry, S.L.; Pitt, W.W.; Gibson, M.R. Oak Ridge National Lab., TN (United States). Dec 1994. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006795. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-top feasibility studies with Hanford single-shell tank (SST) simulants, using a new, low-temperature (50 to 60°C) process for converting nitrate to ammonia and ceramic (NAC), have conclusively shown that between 85 to 99% of the nitrate can be readily converted. In this process, aluminum powders or shot can be used to convert alkaline, nitrate-based supernate to ammonia and an aluminum oxide-sodium aluminate-based solid which might function as its own waste form. The process may actually be able to utilize already contaminated aluminum scrap metal from various DOE sites to effect the conversion. The final, nearly nitrate-free ceramic-like product can be pressed and sintered like other ceramics. Based upon the starting volumes of 6.2 and 3.1 M sodium nitrate solution, volume reductions of 50 to 55% were obtained for the waste form produced, compared to an expected 35 to 50% volume increase if the Hanford supernate were grouted. Engineering data extracted from bench-top studies indicate that the process will be very economical to operate, and data were used to cost a batch, 1,200-kg NO_3/h plant for working off Hanford SST

waste over 20 years. Their total process cost analysis presented in the appendix, indicates that between \$2.01 to 2.66 per kilogram of nitrate converted will be required. Additionally, data on the fate of select radioelements present in solution are presented in this report as well as kinetic, operational, and control data for a number of experiments. Additionally, if the ceramic product functions as its own waste form, it too will offer other cost savings associated with having a smaller volume of waste form as well as eliminating other process steps such as grouting.

953 (ORNL/TM-12631) A low-temperature process for the denitration of Hanford single-shell tank, nitrate-based waste utilizing the nitrate to ammonia and ceramic (NAC) or nitrate to ammonia and glass (NAG) process: Phase 2 report. Mattus, A.J.; Walker, J.F. Jr.; Youngblood, E.L.; Farr, L.L.; Lee, D.D.; Dillow, T.A.; Tieg, T.N. Oak Ridge National Lab., TN (United States). Dec 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006492. Source: OSTI; NTIS; INIS; GPO Dep.

Continuing benchtop studies using Hanford single-shell tank (SST) simulants and actual Oak Ridge National Laboratory (ORNL) low-level waste (LLW), employing a new denitration process for converting nitrate to ammonia and ceramic (NAC), have conclusively shown that between 85 and 99% of the nitrate can be readily converted to gaseous ammonia. In this process, aluminum powders can be used to convert alkaline, nitrate-based supernate to ammonia and an aluminum oxide-sodium aluminate-based solid. The process may be able to use contaminated aluminum scrap metal from DOE sites to effect the conversion. The final, nitrate-free ceramic product can be pressed and sintered like other ceramics or silica and/or fluxing agents can be added to form a glassy ceramic or a flowable glass product. Based upon the starting volumes of 6.2 and 3.1 M sodium nitrate solution, volume reductions of 50 to 70% were obtained for the waste form produced. Sintered pellets produced from supernate from Melton Valley Storage Tanks (MVSTs) have been leached in accordance with the 16.1 leach test for the radioelements ^{85}Sr and ^{137}Cs . Despite lengthy counting times, ^{85}Sr could not be detected in the leachates. ^{137}Cs was only slightly above background and corresponded to a leach index of 12.2 to 13.7 after 8 months of leaching. Leach testing of unsintered and sintered reactor product spiked with hazardous metals proved that both sintered and unsintered product passed the Toxicity Characteristic Leaching Procedure (TCLP) test. Design of the equipment and flowsheet for a pilot demonstration-scale system to prove the nitrate destruction portion of the NAC process and product formation is under way.

954 (ORNL/TM-12660) Fluid dynamic demonstrations for waste retrieval and treatment. Youngblood, E.L. Jr. (Oak Ridge National Lab., TN (United States)); Hylton, T.D.; Berry, J.B.; Cummins, R.L.; Ruppel, F.R.; Hanks, R.W. Oak Ridge National Lab., TN (United States). Feb 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007315. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study was to develop or identify flow correlations for predicting the flow parameters needed for the design and operation of slurry pipeline systems for transporting radioactive waste of the type stored in the Hanford single-shell tanks and the type stored at the Oak Ridge National Laboratory (ORNL). This was done by studying the

flow characteristics of simulated waste with rheological properties similar to those of the actual waste. Chemical simulants with rheological properties similar to those of the waste stored in the Hanford single-shell tanks were developed by Pacific Northwest Laboratories, and simulated waste with properties similar to those of ORNL waste was developed at ORNL for use in the tests. Rheological properties and flow characteristics of the simulated slurry were studied in a test loop in which the slurry was circulated through three pipeline viscometers (constructed of 1/2-, 3/4-, and 1-in. schedule 40 pipe) at flow rates up to 35 gal/min. Runs were made with ORNL simulated waste at 54 wt % to 65 wt % total solids and temperatures of 25°C and 55°C. Grinding was done prior to one run to study the effect of reduced particle size. Runs were made with simulated Hanford single-shell tank waste at approximately 43 wt % total solids and at temperatures of 25°C and 50°C. The rheology of simulated Hanford and ORNL waste supernatant liquid was also measured.

955 (ORNL/TM-12781) Fluid dynamic studies for a simulated Melton Valley Storage Tank slurry. Hylton, T.D.; Youngblood, E.L.; Cummins, R.L. Oak Ridge National Lab., TN (United States). Jul 1994. 145p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95000424. Source: OSTI; NTIS; INIS; GPO Dep.

The Melton Valley Storage Tanks (MVSTs), are used for the collection and storage of remote-handled radioactive liquid wastes. These wastes, which were typically acidic when generated, were neutralized with the addition of sodium hydroxide to protect the storage tanks from corrosion, but this caused the transuranic and heavy metals to precipitate. These wastes will eventually need to be removed from the tanks for ultimate disposal. The objective of the research activities discussed in this report is to support the design of a pipeline transport system between the MVSTs and a treatment facility. Since the wastes in the MVSTs are highly radioactive, a surrogate slurry was developed for this study. Rheological properties of the simulated slurry were determined in a test loop in which the slurry was circulated through three pipeline viscometers of different diameters. Pressure drop data at varying flow rates were used to obtain shear stress and shear rate data. The data were analyzed, and the slurry rheological properties were analyzed by the Power Law model and the Bingham plastic model. The plastic viscosity and yield stress data obtained from the rheological tests were used as inputs for a piping design software package, and the pressure drops predicted by the software compared well with the pressure drop data obtained from the test loop. The minimum transport velocity was determined for the slurry by adding known nominal sizes of glass spheres to the slurry. However, it was shown that the surrogate slurry exhibited hindered settling, which may substantially decrease the minimum transport velocity. Therefore, it may be desired to perform additional tests with a surrogate with a lower concentration of suspended solids to determine the minimum transport velocity.

956 (ORNL/TM-12800) Catalyzed reduction of nitrate in aqueous solutions. Haas, P.A. Oak Ridge National Lab., TN (United States). Aug 1994. 17p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94017660. Source: OSTI; NTIS; INIS; GPO Dep.

Sodium nitrate and other nitrate salts in wastes is a major source of difficulty for permanent disposal. Reduction of nitrate using aluminum metal has been demonstrated, but NH_3 , hydrazine, or organic compounds containing oxygen would be advantageous for reduction of nitrate in sodium nitrate solutions. Objective of this seed money study was to determine minimum conditions for reduction. Proposed procedure was batchwise heating of aqueous solutions in closed vessels with monitoring of temperatures and pressures. A simple, convenient apparatus and procedure were demonstrated for observing formation of gaseous products and collecting samples for analyses. The test conditions were 250°C and 1000 psi max. Any useful reduction of sodium nitrate to sodium hydroxide as the primary product was not found. The nitrate present at pHs < 4 as HNO_3 or NH_4NO_3 is easily decomposed, and the effect of nitromethane at these low pHs was confirmed. When acetic acid or formic acid was added, 21 to 56% of the nitrate in sodium nitrate solutions was reduced by methanol or formaldehyde. With hydrazine and acetic acid, 73 % of the nitrate was decomposed to convert NaNO_3 to sodium acetate. With hydrazine and formic acid, 36% of the nitrate was decomposed. If these products are more acceptable for final disposal than sodium nitrate, the reagents are cheap and the conversion conditions would be practical for easy use. Ammonium acetate or formate salts did not significantly reduce nitrate in sodium nitrate solutions.

957 (PNL-8900) 1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan. Bamberger, J.A.; Liljegren, L.M. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003006. Source: OSTI; NTIS; INIS; GPO Dep.

Million gallon double-shell tanks (DSTs) at Hanford are used to store transuranic, high-level, and low-level wastes. These wastes generally consist of a large volume of salt-laden solution covering a smaller volume of settled sludge primarily containing metal hydroxides. These wastes will be retrieved and processed into immobile waste forms suitable for permanent disposal. The current retrieval concept is to use submerged dual-nozzle pumps to mobilize the settled solids by creating jets of fluid that are directed at the tank solids. The pumps oscillate, creating arcs of high-velocity fluid jets that sweep the floor of the tank. After the solids are mobilized, the pumps will continue to operate at a reduced flow rate sufficient to maintain the particles in a uniform suspension. The objectives of these 1/12-scale scoping experiments are to determine how Reynolds number, Froude number, and gravitational settling parameter affect the degree of uniformity achieved during jet mixer pump operation in the full-scale double-shell tanks; develop linear models to predict the degree of uniformity achieved by jet mixer pumps operating in the full-scale double-shell tanks; apply linear models to predict the degree of uniformity that will be achieved in tank 241-AZ-101 and determine whether contents of that tank will be uniform to within $\pm 10\%$ of the mean concentration; and obtain experimental concentration and jet velocity data to compare with the TEMPEST computational and modeling predictions to guide further code development.

958 (PNL-8901) Development of a multi-functional scarifier dislodger with an integral pneumatic conveyance retrieval system for single-shell tank remediation. FY93 summary report. Bamberger, J.A. (Pacific

Northwest Lab., Richland, WA (United States)); McKinnon, M.A.; Alberts, D.A.; Steele, D.E.; Crowe, C.T. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004358. Source: OSTI; NTIS; INIS; GPO Dep.

The Underground Storage Tank Integrated Demonstration (UST-ID) is evaluating several hydraulic dislodger concepts and retrieval technologies to develop specifications for system that can retrieve wastes from single-shell tanks. Each of the dislodgers will be evaluated sequentially to determine its ability to fracture and dislodge various waste simulants such as salt cake, sludge, and viscous liquid. The retrieval methods will be evaluated to determine their ability to convey this dislodged material from the tank. This report describes ongoing research that commenced in FY93 to develop specifications for a scarifier dislodger coupled with a pneumatic conveyance retrieval system. The scarifier development is described in Section 3; pneumatic conveyance development is described in Section 4. Preliminary system specifications are listed in Section 5. FY94 plans are summarized in Section 6.

959 (PNL-9053) Review and assessment of technologies for the separation of strontium from alkaline and acidic media. Orth, R.J.; Kurath, D.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94008667. Source: OSTI; NTIS; INIS; GPO Dep.

A literature survey has been conducted to identify and evaluate methods for the separation of strontium from acidic and alkaline media as applied to Hanford tank waste. The most promising methods of solvent extraction, precipitation, and ion exchange are described. The following criteria were used for evaluating the separation methods: Appreciable strontium removal must be demonstrated; Strontium selectivity over bulk components must be demonstrated; The method must show promise for evolving into a practical and fairly simple process; The process should be safe to operate; The method must be robust (i.e., capable of separating strontium from various waste types); Secondary waste generation must be minimized; and The method must show resistance to radiation damage. The methods discussed did not necessarily satisfy all of the above criteria; thus, key areas requiring further development are also given for each method. Less promising solvent extraction, precipitation, and ion exchange methods were also identified; areas for potential development are included in this report.

960 (PNL-9409) Technology development activities supporting tank waste remediation. Bonner, W.F.; Beman, G.H. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94013977. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes work being conducted under the U.S. Department of Energy's Office of Technology Development (EM-50) in support of the Tank Waste Remediation System (TWRS) Program. The specific work activities are organized by the following categories: safety, characterization, retrieval, barriers, pretreatment, low-level waste, and high-level waste. In most cases, the activities presented here were identified as supporting tank remediation by EM-50 integrated program or integrated demonstration lead staff and the selections were further refined by contractor staff.

Data sheets were prepared from DOE-HQ guidance to the field issued in September 1993. Activities were included if a significant portion of the work described provides technology potentially needed by TWRS; consequently, not all parts of each description necessarily support tank remediation.

961 (PNL-9434-Rev.1) Organic carbon in Hanford single-shell tank waste. Toth, J.J.; Willingham, C.E.; Heasler, P.G.; Whitney, P.D. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007523. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents an analysis performed by Pacific Northwest Laboratory (PNL) involving the organic carbon laboratory measurement data for Hanford single-shell tanks (SSTs) obtained from a review of the laboratory analytical data. This activity was undertaken at the request of Westinghouse Hanford Company (WHC). The objective of this study is to provide a best estimate, including confidence levels, of total organic carbon (TOC) in each of the 149 SSTs at Hanford. The TOC analyte information presented in this report is useful as part of the criteria to identify SSTs for additional measurements or monitoring for the organic safety program. This report is a precursor to an investigation of TOC and moisture in Hanford SSTs, in order to provide best estimates for each together in one report. Measured laboratory data were obtained for 75 of the 149 SSTs. The data represent a thorough investigation of data from 224 tank characterization datasets, including core-sampling and process laboratory data. Liquid and solid phase TOC values were investigated by examining selected tanks with both reported TOC values in solid and liquid phases. Some relationships were noted, but there was no clustering of data or significance between the solid and liquid phases. A methodology was developed for estimating the distribution and levels of TOC in SSTs using a logarithmic scale and an analysis of variance (ANOVA) technique. The methodology grouped tanks according to waste type using the Sort On Radioactive Waste Type (SORWT) grouping method. The SORWT model categorizes Hanford SSTs into groups of tanks expected to exhibit similar characteristics based on major waste types and processing histories. The methodology makes use of laboratory data for the particular tank and information about the SORWT group of which the tank is a member. Recommendations for a simpler tank grouping strategy based on organic transfer records were made.

962 (PNL-9446) Harmonic analysis of a representative Generation One Tank Waste Retrieval Manipulator. Stoughton, R.S.; Deibler, J.E. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94011434. Source: OSTI; NTIS; INIS; GPO Dep.

A major task for the Generation One Tank Waste Retrieval Manipulator (TWRM) will be to autonomously move a special-purpose end effector at constant velocity along a predetermined trajectory. The end effector will employ water jets to break up waste in the form of sludge into small pieces which can be conveyed outside the tank in a vacuum-driven air conveyance line. The trajectory to be followed will be determined by the mining strategy used. It has not been determined whether or not this trajectory will be modified using feedback from end effector mounted proximity sensors. To maintain required retrieval rates, the end effector trajectory deviations in terms of position and velocity must be kept

within specific limits. The water jets used to break up the waste will generate (somewhat) predictable forces at the end effector. The scope of this study is to bound the motion induced at the end effector by harmonic forces at the end effector. The approach used was to develop a finite element model (FEM) of a representative generation 1 TWRM geometry in three different configurations, and plot the resulting forced harmonic response of the model.

963 (PNL-9814) The Sort on Radioactive Waste Type model: A method to sort single-shell tanks into characteristic groups. Hill, J.G. (Pacific Northwest Lab., Richland, WA (United States)); Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94013958. Source: OSTI; NTIS; INIS; GPO Dep.

The Sort on Radioactive Waste Type (SORWT) model presents a method to categorize Hanford Site single-shell tanks (SSTs) into groups of tank expected to exhibit similar chemical and physical characteristics based on their major waste types and processing histories. This model has identified 29 different waste-type groups encompassing 135 of the 149 SSTs and 93% of the total waste volume in SSTs. The remaining 14 SSTs and associated wastes could not be grouped according to the established criteria and were placed in an ungrouped category. This letter report will detail the assumptions and methodologies used to develop the SORWT model and present the grouping results. In the near future, the validity of the predicted groups will be statistically tested using analysis of variance of characterization data obtained from recent (post-1989) core sampling and analysis activities. In addition, the SORWT model will be used to project the nominal waste characteristics of entire waste type groups that have some recent characterization data available. These subsequent activities will be documented along with these initial results in a comprehensive, formal PNL report cleared for public release by September 1994.

964 (PNL-9814-Rev.1) The Sort on Radioactive Waste Type model: A method to sort single-shell tanks into characteristic groups: Revision 1. Hill, J.G. (Pacific Northwest Lab., Richland, WA (United States)); Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018733. Source: OSTI; NTIS; INIS; GPO Dep.

The Sort on Radioactive Waste Type (SORWT) model presents a method to categorize Hanford Site single-shell tanks (SSTs) into groups of tanks expected to exhibit similar chemical and physical characteristics based on their major waste types and processing histories. This model has identified 29 different waste-type groups encompassing 135 of the 149 SSTs and 93% of the total waste volume in SSTs. The remaining 14 SSTs and associated wastes could not be grouped according to the established criteria and were placed in an ungrouped category. This letter report will detail the assumptions and methodologies used to develop the SORWT model and present the grouping results. Included with this report is a brief description and approximate compositions of the single-shell tank waste types. In the near future, the validity of the predicted groups will be statistically tested using analysis of variance of characterization data obtained from recent (post-1989) core sampling and analysis activities. In addition, the SORWT model will be used to project the nominal waste characteristics of entire waste type groups that have some recent characterization data

available. These subsequent activities will be documented along with these initial results in a comprehensive, formal PNL report cleared for public release by September 1994.

965 (PNL-9814-Rev.2) The Sort on Radioactive Waste Type model: A method to sort single-shell tanks into characteristic groups. Revision 2. Hill, J.G. (Pacific Northwest Lab., Richland, WA (United States)); Anderson, G.S.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009410. Source: OSTI; NTIS; INIS; GPO Dep.

The SORWT model presents a methodology to group SSTs that is both simple to understand and logical in its assumptions and construction. The SORWT model has predicted the existence of 24 groups of SSTs ranging from 22 tanks per group to two tanks per group. These 24 groups encompass 133 tanks and 93% of the total waste contained in SSTs. The first 14 groups (i.e., those that contain four tanks per group or more) represent 109 tanks and 83% of the total waste volume. This demonstrates the potential for using the SORWT model to efficiently allocate resources and to maximize characterization information gained by a minimum number of sampling events. The verification study has shown that the SST groups predicted by the SORWT model are statistically significant and reduce the variability in the concentrations for all analytes examined. The SORWT model organizes a vast amount of information and presents clear options on which SSTs are more desirable to sample. The model is also simple and flexible in its ability to incorporate new parameters such as new SST analytical data, shifting programmatic needs, and/or risk assessment-oriented criteria. This report presents the nominal composition, inventory, and uncertainty for five of the 24 SORWT groups, representing 28 tanks, 10% of the total waste volume, and 29% of the total sludge volume in SSTs. Consequently, this document provides a logical beginning framework for tank waste characterization until further information becomes available or different programmatic needs are identified.

966 (PNL-9959) Mitigation of tank 241-SY-101 by pump mixing: Results of full-scale testing. Stewart, C.W. (and others); Hudson, J.D.; Friley, J.R.; Panisko, F.E.; Antoniuk, Z.I.; Irwin, J.J.; Fadeff, J.G.; Efferding, L.F.; Michener, T.E.; Kirch, N.W. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94016420. Source: OSTI; NTIS; INIS; GPO Dep.

The Full-Scale Mixer Pump Test Program was performed in Hanford Tank 241-SY-101 from February 4 to April 13, 1994, to confirm the long-term operational strategy for flammable gas mitigation and to demonstrate that mixing can control the gas release and waste level. Since its installation on July 3, 1993, the current pump, operating only a few hours per week, has proved capable of mixing the waste sufficiently to release gas continuously instead of in large episodic events. The results of Full-Scale Testing demonstrated that the pump can control gas release and waste level for long-term mitigation, and the four test sequences formed the basis for the long-term operating schedule. The last test sequence, jet penetration tests, showed that the current pump jet creates flow near the tank wall and that it can excavate portions of the bottom sludge layer if run at maximum power. Pump mixing has altered the

'normal' configuration of the waste; most of the original non-convective sludge has been mixed with the supernatant liquid into a mobile convective slurry that has since been maintained by gentle pump operation and does not readily return to sludge.

967 (PNL-9978) Performance evaluation of corrosion probes in simulated WVNS tank 8D-2 waste: WVNS tank farm process support. Elmore, M.R. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94017466. Source: OSTI; NTIS; INIS; GPO Dep.

Five corrosion probes were received from West Valley Nuclear Services for evaluation in simulated tank 8D-2 3rd-stage sludge wash slurry. The same waste slurry simulated was also used in a series of ongoing corrosion studies assessing the effects of in-tank sludge washing on the integrity of tank 8D-2. Two of the corrosion probes were installed in the coupon corrosion test vessels operating at ~150°F to compare performance of the probes with that observed by coupon tests conducted in the same vessels. Corrosion rate data calculated from electrical resistance measurements of the corrosion probes were evaluated for this study using two slightly different approaches. One approach uses the total length of exposure of the probe to give a "time-averaged" value of the corrosion rate. The other approach uses a shorter period of time (relative to the length of the test) in the calculation of corrosion rate, and is referred to as the "instantaneous" rate. The interpretation of the probe data and the implications of corrosion rates calculated with either of these methods are discussed in this report.

968 (PNL-10050) Ferrocyanide Safety Project Dynamic X-Ray Diffraction studies of sodium nickel ferrocyanide reactions with equimolar nitrate/nitrite salts. Dodds, J.N. (Washington State Univ., Pullman, WA (United States). Dept. of Chemical Engineering). Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94017396. Source: OSTI; NTIS; INIS; GPO Dep.

Dynamic X-ray Diffraction (DXRD) has been used to identify and quantify the solid state reactions that take place between sodium nickel ferrocyanide, $\text{Na}_2\text{NiFe}(\text{CN})_6$, and equimolar concentrations of sodium nitrate/nitrite, reactions of interest to the continued environmental safety of several large underground waste storage tanks at the Hanford site in eastern Washington. The results are supportive of previous work, which indicated that endothermic dehydration and melting of the nitrates take place before the occurrence of exothermic reactions that being about 300°C. The DXRD results show that a major reaction set at these temperatures is the occurrence of a series reaction that produces sodium cyanate, NaCNO , as an intermediate in a mildly exothermic first step. In the presence of gaseous oxygen, NaCNO subsequently reacts exothermally and at a faster rate to form metal oxides. Measurements of the rate of this reaction are used to estimate the heat release. Comparisons of this estimated heat release rate with heat transfer rates from a hypothetical "hot spot" show that, even in a worst-case scenario, the heat transfer rates are approximately eight times higher than the rate of energy release from the exothermic reactions.

969 (PNL-10058) Historical trends in tank 241-SY-103 waste temperatures. Antoniuk, Z.I. Pacific Northwest

Lab., Richland, WA (United States). Aug 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94017781. Source: OSTI; NTIS; INIS; GPO Dep.

The gas release and fluctuating level of the waste in tank 241-SY-103 have prompted more detailed interest in its historical behavior, in hopes of achieving a better understanding of its current status. To examine the historical behavior, essentially all of the tank waste temperature data record has been retrieved, examined, and plotted. This report documents the retrieval, critical examination, and graphic presentation of the 241-SY-103 temperature history. The graphic presentations clearly indicate that the long-term tank cooling trend has continued unabated even after late 1991 when vent air flow rates decreased.

970 (PNL-10064) Waste Tank Organic Safety Project organic concentration mechanisms task: FY 1994 progress report. Gerber, M.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001159. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory (PNL), Waste Tank Organic Safety Project is conducting research to support Westinghouse Hanford Company's (WHC) Waste Tank Safety Program, sponsored by the U.S. Department of Energy's Tank Farm Project Office. The goal of PNL's program is to provide a scientific basis for analyzing organics in Hanford's underground storage tanks (USTs) and for determining whether they are at concentrations that pose a potentially unsafe condition. Part of this research is directed toward determining what organic concentrations are safe by conducting research on organic aging mechanisms and waste energetics to assess the conditions necessary to produce an uncontrolled energy release in tanks due to reactions between the organics and the nitrate and nitrate salts in the tank wastes. The objective of the Organic Concentration Mechanisms Task is to assess the degree of localized enrichment of organics to be expected in the USTs due to concentration mechanisms. This report describes the progress of research conducted in FY 1994 on two concentration mechanisms of interest to the tank safety project: (1) permeation of a separate organic liquid phase into the interstitial spaces of the tank solids during the draining of free liquid from the tanks; and (2) concentration of organics on the surfaces of the solids due to adsorption. Three experiments were conducted to investigate permeation of air and solvent into a sludge simulant that is representative of single-shell tank sludge. The permeation behavior of air and solvent into the sludge simulant can be explained by the properties of the fluid pairs (air/supernate and solvent supernate) and the sludge. One important fluid property is the interfacial tension between the supernate and either the solvent or air. In general, the greater the interfacial tension between two fluids, the more difficult it will be for the air or solvent to displace the supernate during dewatering of the sludge.

971 (PNL-10067) Assessment of the potential for ammonium nitrate formation and reaction in Tank 241-SY-101. Pederson, L.R.; Bryan, S.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018404. Source: OSTI; NTIS; INIS; GPO Dep.

Two principal scenarios by which ammonium nitrate may be formed were considered: (a) precipitation of ammonium nitrate in the waste, and (b) ammonium nitrate formation via the gas phase reaction of ammonia and nitrogen dioxide. The first of these can be dismissed because ammonium ions, which are necessary for ammonium nitrate precipitation, can exist only in negligibly small concentrations in strongly alkaline solutions. Gas phase reactions between ammonia, nitrogen dioxide, and water vapor in the gas phase represent the most likely means by which ammonium nitrate aerosols could be formed in Tank 241-SY-101. Predicted ammonium nitrate formation rates are largely controlled by the concentration of nitrogen dioxide. This gas has not been detected among those gases vented from the wastes using Fourier Transform Infrared Spectrometry (FTIR) or mass spectrometry. While detection limits for nitrogen dioxide have not been established experimentally, the maximum concentration of nitrogen dioxide in the gas phase in Tank 241-SY-101 was estimated at 0.1 ppm based on calculations using the HITRAN data base and on FTIR spectra of gases vented from the wastes. At 50 C and with 100 ppm ammonia also present, less than one gram of ammonium nitrate per year is estimated to be formed in the tank. To date, ammonium nitrate has not been detected on HEPA filters in the ventilation system, so any quantity that has been formed in the tank must be quite small, in good agreement with rate calculations. The potential for runaway exothermic reactions involving ammonium nitrate in Tank 241-SY-101 is minimal. Dilution by non-reacting waste components, particularly water, would prevent hazardous exothermic reactions from occurring within the waste slurry, even if ammonium nitrate were present. 41 refs.

972 (PNL-10074) Hazardous waste dislodging and conveyance: The confined sluicing method. Summers, D.A. (Univ. of Missouri, Rolla, MO (United States). High Pressure Waterjet Lab.); Fossey, R.D.; Mann, M.D.; Blaine, J.G.; Rinker, M.W. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000426. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes an investigation of a means for dislodging and conveying waste currently stored in underground storage tanks. A series of experiments have been carried out to evaluate the potential of a medium pressure, medium flow rate cutting system as a means of dislodging the waste. It has been found that waterjets at a pressure of 10,000 psi can effectively cut the material which has been chosen to simulate the hardened saltcake within the storage tanks. Based on a parameterization test it has thus been calculated that an inlet flow volume of approximately 30 gallons per minute will be sufficient to excavate 30 gallons per minute of waste from a tank. In order to transport the resulting slurry from the tank, a modified jet pump has been developed and has demonstrated its capability of conveying fluid and waste particles, up to one inch in diameter, to a height of more than 60 feet. Experiments were conducted to examine different configurations to achieve the production levels required for waste removal and to clean the walls of residual material. It was found more effective to clean the walls using an inclined angle of impact rather than a perpendicular angle of impact in order to provide a safeguard against driving the water through any cracks in the containment. It was demonstrated that excavation can take place with almost total immediate extraction of the water and debris from the cutting process. The results have qualitatively

shown the potential of a medium pressure waterjet system for achieving the required results for underground storage tank waste retrieval.

973 (PNL-10075) Composition, preparation, and gas generation results from simulated wastes of Tank 241-SY-101. Bryan, S.A.; Pederson, L.R. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018619. Source: OSTI; NTIS; INIS; GPO Dep.

This document reviews the preparation and composition of simulants that have been developed to mimic the wastes temporarily stored in Tank 241-SY-101 at Hanford. The kinetics and stoichiometry of gases that are generated using these simulants are also compared, considering the roles of hydroxide, chloride, and transition metal ions; the identities of organic constituents; and the effects of dilution, radiation, and temperature. Work described in this report was conducted for the Flammable Gas Safety Program at Pacific Northwest Laboratory, (a) whose purpose is to develop information that is necessary to mitigate potential safety hazards associated with waste tanks at the Hanford Site. The goal of this research and of related efforts at the Georgia Institute of Technology (GIT), Argonne National Laboratory (ANL), and Westinghouse Hanford Company (WHC) is to determine the thermal and thermal/radiolytic mechanisms by which flammable and other gases are produced in Hanford wastes, emphasizing those stored in Tank 241-SY-101. A variety of Tank 241-SY-101 simulants have been developed to date. The use of simulants in laboratory testing activities provides a number of advantages, including elimination of radiological risks to researchers, lower costs associated with experimentation, and the ability to systematically alter simulant compositions to study the chemical mechanisms of reactions responsible for gas generation. The earliest simulants contained the principal inorganic components of the actual waste and generally a single complexant such as N-(2-hydroxyethyl) ethylenediaminetriacetic acid (HEDTA) or ethylenediaminetriacetic acid (EDTA). Both homogeneous and heterogeneous compositional forms were developed. Aggressive core sampling and analysis activities conducted during Windows C and E provided information that was used to design new simulants that more accurately reflected major and minor inorganic components.

974 (PNL-10091) Some theories of dissolved gas release from Tank 241-SY-101. Allemann, R.T. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000769. Source: OSTI; NTIS; INIS; GPO Dep.

This report explains the ammonia release data to an order of magnitude agreement by the combination of three mechanisms of release: (1) bubble transport, (2) permeation/diffusion through the upper layers of the waste, and (3) diffusion/evaporation from freshly exposed liquid surfaces. Bounded by these mechanisms, there is low danger of extremely high ammonia concentrations in the off gas. This condition would occur through some (unlikely) continuous replenishing of fresh liquid on the surface. This would not occur unless there were continuous energetic rollovers, which seem very unlikely given historical evidence, or by energetic mixing of the waste with more power than provided by the current mixing pump. Nitrous oxide is of low solubility in the waste and behaves similarly to hydrogen.

975 (PNL-10095) Waste dislodging and conveyance testing summary and conclusions to date. Rinker, M.W. (Pacific Northwest Lab., Richland, WA (United States)); Hatchell, B.K.; Mullen, O.D. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001158. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes recent work performed by the Waste Dislodging and Conveyance technology development program to provide assistance with the retrieval of wastes from the Hanford single-shell tanks (SSTs). This work is sponsored by the Underground Storage Tank-Integrated Demonstration (UST-ID) Office with the U.S. Department of Energy (DOE) Office of Technology Development. A baseline technology of high-pressure water-jet dislodging and pneumatic conveyance integrated as a scarifier is proposed as a means of retrieval. The tests and studies described were performed to demonstrate that at least one robust technology exists that could be effectively used with low water-addition arm-based systems. These results are preliminary and do not represent an optimized baseline. The Waste Dislodging and Conveyance work thus far has demonstrated that waterjet mobilization and air conveyance can mobilize and convey SST waste simulants at the target rates while operating within the space envelope and the dynamic loading constraints of deployment devices. The recommended technologies are well proven in industrial applications and are quite robust, yet lightweight and relatively benign to the retrieval environment. The baseline approach has versatility to continuously dislodge and convey a broad range of waste forms, from hard wastes to soft sludge wastes. The approach also has the major advantage of being noncontact with the waste surface under normal operation.

976 (PNL-10099) Tank characterization report for Single-Shell Tank B-111. Remund, K.M.; Tingey, J.M.; Heasler, P.G.; Toth, J.J.; Ryan, F.M.; Hartley, S.A.; Simpson, D.B.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001660. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-B-111 (hereafter referred to as B-111) is a 2,006,300 liter (530,000 gallon) single-shell waste tank located in the 200 East B tank farm at Hanford. Two cores were taken from this tank in 1991 and analysis of the cores was conducted by Battelle's 325-A Laboratory in 1993. Characterization of the waste in this tank is being done to support Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-44-05. Tank B-111 was constructed in 1943 and put into service in 1945; it is the second tank in a cascade system with Tanks B-110 and B-112. During its process history, B-111 received mostly second-decontamination-cycle waste and fission products waste via the cascade from Tank B-110. This tank was retired from service in 1976, and in 1978 the tank was assumed to have leaked 30,300 liters (8,000 gallons). The tank was interim stabilized and interim isolated in 1985. The tank presently contains approximately 893,400 liters (236,000 gallons) of sludge-like waste and approximately 3,800 liters (1,000 gallons) of supernate. Historically, there are no unreviewed safety issues associated with this tank and none were revealed after reviewing the data from the latest core sampling event in 1991. An extensive set of analytical measurements was performed on the core composites. The major constituents (> 0.5 wt%) measured in

the waste are water, sodium, nitrate, phosphate, nitrite, bismuth, iron, sulfate and silicon, ordered from largest concentration to the smallest. The concentrations and inventories of these and other constituents are given. Since Tanks B-110 and B-111 have similar process histories, their sampling results were compared. The results of the chemical analyses have been compared to the dangerous waste codes in the Washington Dangerous Waste Regulations (WAC 173-303). This assessment was conducted by comparing tank analyses against dangerous waste characteristics 'D' waste codes; and against state waste codes.

977 (PNL-10100) Tank characterization report for single-shell Tank B-201. Heasler, P.G.; Remund, K.M.; Tingey, J.M.; Baird, D.B.; Ryan, F.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001311. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to characterize the waste in single shell Tank B-201. Characterization includes the determination of the physical, chemical (e.g., concentrations of elements and organic species), and radiological properties of the waste. These determinations are made using analytical results from B-201 core samples as well as historical information about the tank. The main objective is to determine average waste properties; but in some cases, concentrations of analytes as a function of depth were also determined. This report also consolidates the available historical information regarding Tank B-201, arranges the analytical information from the recent core sampling in a useful format, and provides an interpretation of the data within the context of what is known about the tank.

978 (PNL-10101) Tank characterization report for Single-Shell Tank T-102. Remund, K.M.; Hartley, S.A.; Toth, J.J.; Tingey, J.M.; Heasler, P.G.; Ryan, F.M.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001659. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-T-102 (hereafter referred to as T-102) is a 530,000 gallon single-shell waste tank located in the 200 West T Tank farm at the Hanford Site. In 1993, two cores were taken from this tank and analysis of the cores was conducted by Battelle's 325-A Laboratory. Characterization of the waste in this tank was conducted to support Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-44-05. Tank T-102 was constructed in 1943 and put into service in 1945; it is the second tank in a cascade system with Tanks T-101 and T-103. During its process history, Tank T-102 received mostly Metal Waste (MW) from the Bismuth Phosphate Process and Coating Waste (CW) from the REDOX Process via the cascade from Tank T-101 and in transfers from Tank C-102. In 1956, the MW was removed from T-102 by pumping and sluicing. This tank was declared inactive and retired from service in 1976. In 1981, intrusion prevention and stabilization measures were taken to isolate the waste in T-102. The tank presently contains approximately 121,100 liters (32,000 gallons) of liquid and sludge-like waste. Historically, there are no unreviewed safety issues associated with this tank and none were revealed after reviewing the data from the latest core sampling event in 1993. An extensive set of analytical measurements was performed on the core composites. The major constituents (>0.5 wt%) of the waste are water, aluminum, sodium, iron, and nitrate, ordered from the

largest concentration to the smallest. The concentrations and inventories of these and other constituents are given. The results of the chemical analyses have been compared to the dangerous waste codes in the Washington Dangerous Waste Regulations (WAC 173-303).

979 (PNL-10105) Assessment of alternative mitigation concepts for Hanford flammable gas tanks. Stewart, C.W.; Schienbein, L.A.; Hudson, J.D.; Eschbach, E.J.; Lessor, D.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 169p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000770. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a review and assessment of four selected mitigation concepts: pump jet mixing, sonic vibration, dilution, and heating. Though the relative levels of development of these concepts are quite different, some definite conclusions are made on their comparative feasibility. Key findings of this report are as follows. A mixer pump has proven to be a safe and effective active mitigation method in Tank 241-SY-101, and the authors are confident that mixer pumps will effectively mitigate other tanks with comparable waste configurations and properties. Low-frequency sonic vibration is also predicted to be effective for mitigation. Existing data cannot prove that dilution can mitigate gas release event (GRE) behavior. However, dilution is the only concept of the four that potentially offers passive mitigation. Like dilution, heating the waste cannot be proven with available information to mitigate GRE behavior. The designs, analyses, and data from which these conclusions are derived are presented along with recommendations.

980 (PNL-10107) Public values related to decisions in the Tank Waste Remediation System Program. Armacost, L.L. (Pacific Northwest Lab., Richland, WA (United States)); Robershotte, M.; von Winterfeldt, D.; Creighton, J. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002853. Source: OSTI; NTIS; INIS; GPO Dep.

Managers of the Tank Waste Remediation System (TWRS) Program have to make numerous decisions, ranging from the strategic decisions on the fundamental tank cleanup goals to technical decisions on which types of equipment to use in mechanical retrieval of wastes. Furthermore, many of these decisions have to be made repeatedly (e.g., the annual allocation of research and development funds to TWRS activities). These decisions have many potential consequences in terms of risks to workers, risks to the public, environmental impacts, and economic development and cost. Because these consequences affect the values of many parties, the consequences need to be evaluated in terms that are accepted and understood by the interested parties. Therefore, an effort needs to be made to incorporate public concerns and values into the TWRS decision-making process. The purpose of this report is to review and integrate this past work on values and to create a master list of values in order to create a consistent value framework for the numerous TWRS decisions; efficiently and effectively use public values in the decision-making process by updating this report on a regular basis to ensure that the information represents the public's current views; provide guidance about using values in technical TWRS decisions.

981 (PNL-10127) Flammable gas safety program: Analytical methods development: FY 1994 progress report. Campbell, J.A.; Clauss, S.; Grant, K.; Hoopes, V.; Lerner, B.; Lucke, R.; Mong, G.; Rau, J.; Wahl, K.; Steele, R. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001661. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the status of developing analytical methods to account for the organic components in Hanford waste tanks, with particular focus on tanks assigned to the Flammable Gas Watch List. The methods that have been developed are illustrated by their application to samples obtained from Tank 241-SY-101 (Tank 101-SY).

982 (PNL-10128) Waste Tank Organic Safety Program: Analytical methods development: Progress report, FY 1994. Campbell, J.A. (and others); Clauss, S.A.; Grant, K.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001658. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of this task are to develop and document extraction and analysis methods for organics in waste tanks, and to extend these methods to the analysis of actual core samples to support the Waste Tank organic Safety Program. This report documents progress at Pacific Northwest Laboratory (a) during FY 1994 on methods development, the analysis of waste from Tank 241-C-103 (Tank C-103) and T-111, and the transfer of documented, developed analytical methods to personnel in the Analytical Chemistry Laboratory (ACL) and 222-S laboratory. This report is intended as an annual report, not a completed work.

983 (PNL-10130) Waste Tank Vapor Project: Tank vapor database development. Seesing, P.R.; Birn, M.B.; Manke, K.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000898. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the Tank Vapor Database (TVD) Development task in FY 1994 was to create a database to store, retrieve, and analyze data collected from the vapor phase of Hanford waste tanks. The data needed to be accessible over the Hanford Local Area Network to users at both Westinghouse Hanford Company (WHC) and Pacific Northwest Laboratory (PNL). The data were restricted to results published in cleared reports from the laboratories analyzing vapor samples. Emphasis was placed on ease of access and flexibility of data formatting and reporting mechanisms. Because of time and budget constraints, a Rapid Application Development strategy was adopted by the database development team. An extensive data modeling exercise was conducted to determine the scope of information contained in the database. A SUN Sparcstation 1000 was procured as the database file server. A multi-user relational database management system, Sybase®, was chosen to provide the basic data storage and retrieval capabilities. Two packages were chosen for the user interface to the database: DataPrism® and Business Objects™. A prototype database was constructed to provide the Waste Tank Vapor Project's Toxicology task with summarized and detailed information presented at Vapor Conference 4 by WHC, PNL, Oak Ridge National Laboratory, and Oregon Graduate Institute. The prototype was used to develop a list of reported compounds,

and the range of values for compounds reported by the analytical laboratories using different sample containers and analysis methodologies. The prototype allowed a panel of toxicology experts to identify carcinogens and compounds whose concentrations were within the reach of regulatory limits. The database and user documentation was made available for general access in September 1994.

984 (PNL-10134) Tank waste processing analysis: Database development, tank-by-tank processing requirements, and examples of pretreatment sequences and schedules as applied to Hanford Double-Shell Tank Supernatant Waste - FY 1993. Colton, N.G. (Pacific Northwest Lab., Richland, WA (United States)); Orth, R.J.; Aitken, E.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005754. Source: OSTI; NTIS; INIS; GPO Dep.

This report gives the results of work conducted in FY 1993 by the Tank Waste Processing Analysis Task for the Underground Storage Tank Integrated Demonstration. The main purpose of this task, led by Pacific Northwest Laboratory, is to demonstrate a methodology to identify processing sequences, i.e., the order in which a tank should be processed. In turn, these sequences may be used to assist in the development of time-phased deployment schedules. Time-phased deployment is implementation of pretreatment technologies over a period of time as technologies are required and/or developed. The work discussed here illustrates how tank-by-tank databases and processing requirements have been used to generate processing sequences and time-phased deployment schedules. The processing sequences take into account requirements such as the amount and types of data available for the tanks, tank waste form and composition, required decontamination factors, and types of compact processing units (CPUS) required and technology availability. These sequences were developed from processing requirements for the tanks, which were determined from spreadsheet analyses. The spreadsheet analysis program was generated by this task in FY 1993. Efforts conducted for this task have focused on the processing requirements for Hanford double-shell tank (DST) supernatant wastes (pumpable liquid) because this waste type is easier to retrieve than the other types (saltcake and sludge), and more tank space would become available for future processing needs. The processing requirements were based on Class A criteria set by the U.S. Nuclear Regulatory Commission and Clean Option goals provided by Pacific Northwest Laboratory.

985 (PNL-10138) Retained gas sampler visualization guide. Shekariz, A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001790. Source: OSTI; NTIS; INIS; GPO Dep.

In a series of experiments performed in Phase II of the retained gas sampler visualization task, the effect of sampler tip geometry on waste sampling process has been investigated. From flow visualizations, which were captured on video, it is clear that disturbances on the surrounding fluid and the fluid entering the sampler were reduced as the tip changed from a flat to a sharper truncated cone shape. It has been shown, throughout this report, that deformation and disturbance of the waste is dominated by shape of the sampler tip, which moves the stagnation point, and not by viscosity of the fluid or sampling rate.

986 (PNL-10150) Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994. Rai, D.; Felmy, A.R.; Smith, S.C.; Ryan, J.L. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001923. Source: OSTI; NTIS; INIS; GPO Dep.

The solubility of $\text{Cs}_2\text{NiFe}(\text{CN})_6(c)$ [1] as a function of NaOH and temperature was determined to ascertain whether [1] shows retrograde solubility (i.e., decreasing solubility with increasing temperature), which would have bearing on the possible formation of "hot spots" in the tanks and thus the safety of the ferrocyanide tanks. The results show that the aqueous concentrations of Cs in equilibrium with [1] at 25, 60, 75 and 90 C are similar (within the limits of experimental error), indicating that [1] does not show retrograde solubility. To understand general solubility relationships of $\text{Ni}_2\text{Fe}(\text{CN})_6(c)$ [2] and to determine the influence on solubility of high electrolyte concentrations (e.g., NaNO_3) that are commonly encountered in the ferrocyanide tanks, the solubility of [2] as a function of CsNO_3 , NiCl_2 , and NaNO_3 was determined. In general, [2] is fairly insoluble and shows slightly increased solubility at high electrolyte concentrations only. For [2] in NiCl_2 , the aqueous Fe concentrations show first a decrease and then an increase with the increase in NiCl_2 concentrations. The increase in Fe concentrations at high Ni concentrations appears to be the result of replacement of Fe by Ni in the [2] structure. For [2] in CsNO_3 and at 0.001 M $\text{Na}_4\text{Fe}(\text{CN})_6$, the Cs is quantitatively removed from solution at low added Cs concentrations and appears to approach the final solid composition of [1]. The solubility of [2] in NaNO_3 and at 0.001 M $\text{Na}_4\text{Fe}(\text{CN})_6$ shows an increase in Ni concentrations to about 0.5 mg/l at NaNO_3 concentrations > 1.0 M. These increased Ni concentrations may be the result of substitution of Na for Ni in the solid phase.

987 (PNL-10153) Laboratory testing in-tank sludge washing, summary letter report. Norton, M.V.; Torres-Ayala, F. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001157. Source: OSTI; NTIS; INIS; GPO Dep.

In-tank washing is being considered as a means of pre-treating high-level radioactive waste sludges, such as neutralized current acid waste (NCAW) sludge. For this process, the contents of the tank will be allowed to settle, and the supernatant solution will be decanted and removed. A dilute sodium hydroxide/sodium nitrite wash solution will be added to the settled sludge and the tank contents will be mixed with a mixer pump system to facilitate washing of the sludge. After thorough mixing, the mixer pumps will be shut off and the solids will be allowed to re-settle. After settling, the supernatant solution will be withdrawn from the tank, and the wash cycle will be repeated several times with fresh wash solution. Core sample data of double shell tank 241-AZ-101 indicate that settling of NCAW solids may be very slow. A complicating factor is that strong thermal currents are expected to be generated from heat produced by radionuclides in the sludge layer at the bottom of the tank. Additionally, there are concerns that during the settling period (i.e., while mixing pumps and air-lift re-circulators are shut off), the radionuclides may heat the residual interstitial water in the sludge to the extent that violent steam discharges (steam bumping) could occur. Finally, there are concerns that during the washing steps sludge settling may be hindered as a result of the reduced ionic strength of the wash solution. To overcome the postulated reduced settling

rates during the second and third washing steps, the use of flocculants is being considered. To address the above concerns and uncertainties associated with in-tank washing, PNL has conducted laboratory testing with simulant tank waste to investigate settling rates, steam bump potential, and the need for and use of flocculating agents.

988 (PNL-10160) Cesium uptake capacity of simulated ferrocyanide tank waste. Interim report FY 1994, Ferrocyanide Safety Project. Burgeson, I.E.; Bryan, S.A.; Burger, L.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002855. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this project is to determine the capacity for ^{137}Cs uptake by mixed metal ferrocyanides present in Hanford waste tanks, and to assess the potential for aggregation of these ^{137}Cs exchanged materials to form tank "hot-spots." This research, performed at the Pacific Northwest Laboratory (PNL) for the Westinghouse Hanford Company (WHC), stems from concerns of possible localized radiolytic heating within the tanks. If radioactive cesium is exchanged and concentrated by the remaining nickel ferrocyanide present in the tanks, this heating could cause temperatures to rise above the safety limits specified for the ferrocyanide tanks. For the purposes of this study, two simulants, In-Farm-2 and U-Plant-2, were chosen to represent the wastes generated by the scavenging processes. These simulants were formulated using protocols from the original cesium scavenging campaign. Later additions of cesium-rich wastes from various processes also were considered. The simulants were prepared and centrifuged to obtain a moist ferrocyanide sludge. The centrifuged sludges were treated with the original supernate spiked with a known amount of cesium nitrate. After analysis by flame atomic absorption spectrometry, distribution coefficients (K_d) were calculated. The capacity of solid waste simulants to exchange radioactive cesium from solution was examined. Initial results showed that the greater the molar ratio of cesium to cesium nickel ferrocyanide, the less effective the exchange of cesium from solution. The theoretical capacity of 2 mol cesium per mol of nickel ferrocyanide was not observed. The maximum capacity under experimental conditions was 0.35 mol cesium per mol nickel ferrocyanide. Future work on this project will examine the layering tendency of the cesium nickel ferrocyanide species.

989 (PNL-10161) Organic Tanks Safety Program: Waste aging studies. Camaioni, D.M.; Samuels, W.D.; Lenihan, B.D.; Clauss, S.A.; Wahl, K.L.; Campbell, J.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004359. Source: OSTI; NTIS; INIS; GPO Dep.

The underground storage tanks at the Hanford Complex contain wastes generated from many years of plutonium production and recovery processes, and mixed wastes from radiological degradation processes. The chemical changes of the organic materials used in the extraction processes have a direct on several specific safety issues, including potential energy releases from these tanks. This report details the first year's findings of a study charged with determining how thermal and radiological processes may change the composition of organic compounds disposed to the tank. Their approach relies on literature precedent, experiments with simulated waste, and studies of model reactions.

During the past year, efforts have focused on the global reaction kinetics of a simulated waste exposed to γ radiation, the reactions of organic radicals with nitrite ion, and the decomposition reactions of nitro compounds. In experiments with an organic tank non-radioactive simulant, the authors found that gas production is predominantly radiolytically induced. Concurrent with gas generation they observe the disappearance of EDTA, TBP, DBP and hexone. In the absence of radiolysis, the TBP readily saponifies in the basic medium, but decomposition of the other compounds required radiolysis. Key organic intermediates in the model are C-N bonded compounds such as oximes. As discussed in the report, oximes and nitro compounds decompose in strong base to yield aldehydes, ketones and carboxylic acids (from nitriles). Certain aldehydes can react in the absence of radiolysis to form H_2 . Thus, if the pathways are correct, then organic compounds reacting via these pathways are oxidizing to lower energy content. 75 refs.

990 (PNL-10163) Computational analysis of coupled fluid, heat, and mass transport in ferrocyanide single-shell tanks: FY 1994 interim report. Ferrocyanide Tank Safety Project. McGrail, B.P. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004226. Source: OSTI; NTIS; INIS; GPO Dep.

A computer modeling study was conducted to determine whether natural convection processes in single-shell tanks containing ferrocyanide wastes could generate localized precipitation zones that significantly concentrate the major heat-generating radionuclide, ^{137}Cs . A computer code was developed that simulates coupled fluid, heat, and single-species mass transport on a regular, orthogonal finite-difference grid. The analysis showed that development of a "hot spot" is critically dependent on the temperature dependence for the solubility of $\text{Cs}_2\text{NiFe}(\text{CN})_6$ or $\text{CsNaNiFe}(\text{CN})_6$. For the normal case, where solubility increases with increasing temperature, the net effect of fluid flow, heat, and mass transport is to disperse any local zones of high heat generation rate. As a result, hot spots cannot physically develop for this case. However, assuming a retrograde solubility dependence, the simulations indicate the formation of localized deposition zones that concentrate the ^{137}Cs near the bottom center of the tank where the temperatures are highest. Recent experimental studies suggest that $\text{Cs}_2\text{NiFe}(\text{CN})_6(\text{c})$ does not exhibit retrograde solubility over the temperature range 25°C to 90°C and NaOH concentrations to 5 M. Assuming these preliminary results are confirmed, no natural mass transport process exists for generating a hot spot in the ferrocyanide single-shell tanks.

991 (PNL-10172) Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994). Ligothke, M.W.; Pool, K.H.; Lerner, B.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002583. Source: OSTI; NTIS; INIS; GPO Dep.

This report is to provide analytical results for use in safety and toxicological evaluations of the vapor space of Hanford single-shell waste storage tanks C-103. Samples were analysed to determine concentrations of ammonia, nitric oxide, nitrogen dioxide, sulfur oxides, and hydrogen cyanide. In addition to the samples, controls were analyzed that included blanks, spiked blanks, and spiked samples. These controls provided information about the suitability of sampling and

analytical methods. Also included are the following: information describing the methods and sampling procedures used; results of sample analyses; and Conclusions and recommendations.

992 (PNL-10173) Ammonia in simulated Hanford double-shell tank wastes: Solubility and effects on surface tension. Norton, J.D.; Pederson, L.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002322. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive and wastes left from defense materials production activities are temporarily stored in large underground tanks at the Hanford Site in south central Washington State (Tank Waste Science Panel 1991). Some of these wastes are in the form of a thick slurry ("double-shell slurry") containing sodium nitrate, sodium nitrite, sodium aluminate, sodium hydroxide, sodium carbonate, organic complexants and buffering agents, complexant fragments and other minor components (Herting et al. 1992a; Herting et al. 1992b; Campbell et al. 1994). As a result of thermal and radiolytic processes, a number of gases are known to be produced by some of these stored wastes, including ammonia, nitrous oxide, nitrogen, hydrogen, and methane (Babad et al. 1991; Ashby et al. 1992; Meisel et al. 1993; Ashby et al. 1993; Ashby et al. 1994; Bryan et al. 1993; US Department of Energy 1994). Before the emplacement of a mixer pump, these gases were retained in and periodically released from Tank 241-SY-101, a double-shell tank at the Hanford Site (Babad et al. 1992; US Department of Energy 1994). Gases are believed to be retained primarily in the form of bubbles attached to solid particles (Bryan, Pederson, and Scheele 1992), with very little actually dissolved in the liquid. Ammonia is an exception. The relation between the concentration of aqueous ammonia in such concentrated, caustic mixtures and the ammonia partial pressure is not well known, however.

993 (PNL-10175) Ferrocyanide Safety Project: Comparison of actual and simulated ferrocyanide waste properties. Scheele, R.D.; Burger, L.L.; Sell, R.L.; Bredt, P.R.; Barrington, R.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008920. Source: OSTI; NTIS; INIS; GPO Dep.

In the 1950s, additional high-level radioactive waste storage capacity was needed to accommodate the wastes that would result from the production of recovery of additional nuclear defense materials. To provide this additional waste storage capacity, the Hanford Site operating contractor developed a process to decontaminate aqueous wastes by precipitating radiocesium as an alkali nickel ferrocyanide; this process allowed disposal of the aqueous waste. The radiocesium scavenging process as developed was used to decontaminate (1) first-cycle bismuth phosphate (BiPO_4) wastes, (2) acidic wastes resulting from uranium recovery operations, and (3) the supernate from neutralized uranium recovery wastes. The radiocesium scavenging process was often coupled with other scavenging processes to remove radiostrontium and radiocobalt. Because all defense materials recovery processes used nitric acid solutions, all of the wastes contained nitrate, which is a strong oxidizer. The variety of wastes treated, and the occasional coupling of radiostrontium and radiocobalt scavenging processes with the

radiocesium scavenging process, resulted in ferrocyanide-bearing wastes having many different compositions. In this report, we compare selected physical, chemical, and radiochemical properties measured for Tanks C-109 and C-112 wastes and selected physical and chemical properties of simulated ferrocyanide wastes to assess the representativeness of stimulants prepared by WHC.

994 (PNL-10176) A survey of existing and emerging technologies for external detection of liquid leaks at the Hanford Site. Lewis, R.E.; Teel, S.S. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002585. Source: OSTI; NTIS; INIS; GPO Dep.

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During the history of the Hanford Site, many structures were built that stored and transported liquids used for the production mission; some of these structures are still active. Active structures include underground storage tanks retention basins, and pipes and pipelines. Many of the liquids stored and transported in these structures are potentially hazardous to human health and the environment. Any leakage of liquids from active structures, has the added potential to mobilize contaminants in the unsaturated zone. Therefore, it is beneficial to monitor these structures for leaks. The purpose of this report is to catalog existing and emerging technologies that have potential for the external monitoring of liquid leaks. The report will focus primarily on the needs at the Hanford Site tank farms that are located in the 200 Areas, but will also be relevant to other Hanford Site facilities. Leak detection systems, both external and internal, are currently used at some Hanford facilities. This report focuses on the detection of leaks as they migrate into the soils surrounding the facilities.

995 (PNL-10185) Aerosol characteristics in the off-gas from a pilot-scale sluicing operation. Ligothe, M.W.; Whyatt, G.A.; Beckett, M.R. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006367. Source: OSTI; NTIS; INIS; GPO Dep.

A pilot-scale study was performed to simulate conditions anticipated during sluicing operations to retrieve waste in single-shell Tank 241-C-106 at the US Department of Energy's Hanford Site in southeastern Washington. The objective of the study was to identify and characterize the potential aerosol source term at the inlet of the headspace exhaust ventilation system during sluicing operations. The information is needed to support decisions for components to be used in the full-scale operation. A secondary objective was to qualitatively evaluate the visibility during sluicing. Three simulated sluicing tests were performed in the 336 Building's quarter-scale waste tank facility located at Hanford. Scaling relationships were used to guide modifications to the quarter-scale tank to accommodate tests that simulated tank geometry, sluicing, and ventilation conditions in the full-scale tank. Simulated sluicing fluids were targeted on solid and liquid surfaces during the tests. Test conditions were monitored, and aerosol measurements were made in the offgas ventilation duct. Also during the tests, an in-tank camera was used to monitor visibility.

996 (PNL-10189) Toxicologic evaluation of analytes from Tank 241-C-103. Mahlum, D.D.; Young, J.Y.; Weller, R.E. Pacific Northwest Lab., Richland, WA (United

States). Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003175. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company requested PNL to assemble a toxicology review panel (TRP) to evaluate analytical data compiled by WHC, and provide advice concerning potential health effects associated with exposure to tank-vapor constituents. The team's objectives would be to (1) review procedures used for sampling vapors from tanks, (2) identify constituents in tank-vapor samples that could be related to symptoms reported by workers, (3) evaluate the toxicological implications of those constituents by comparison to establish toxicological databases, (4) provide advice for additional analytical efforts, and (5) support other activities as requested by WHC. The TRP represents a wide range of expertise, including toxicology, industrial hygiene, and occupational medicine. The TRP prepared a list of target analytes that chemists at the Oregon Graduate Institute/Sandia (OGI), Oak Ridge National Laboratory (ORNL), and PNL used to establish validated methods for quantitative analysis of head-space vapors from Tank 241-C-103. This list was used by the analytical laboratories to develop appropriate analytical methods for samples from Tank 241-C-103. Target compounds on the list included acetone, acetonitrile, ammonia, benzene, 1, 3-butadiene, butanal, n-butanol, hexane, 2-hexanone, methylene chloride, nitric oxide, nitrogen dioxide, nitrous oxide, dodecane, tridecane, propane nitrile, sulfur oxide, tributyl phosphate, and vinylidene chloride. The TRP considered constituent concentrations, current exposure limits, reliability of data relative to toxicity, consistency of the analytical data, and whether the material was carcinogenic or teratogenic. A final consideration in the analyte selection process was to include representative chemicals for each class of compounds found.

997 (PNL-10198) The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste. Tingey, J.M.; Bredt, P.R.; Shade, E.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003176. Source: OSTI; NTIS; INIS; GPO Dep.

Of the 177 high-level waste underground storage tanks at the Hanford Site, 25 have been identified as being potentially capable of generating and releasing flammable gas. Tank 241-SY-101 has exhibited periodic releases of gas, and in some cases the gas released has exceeded the lower flammable gas limit. The components of the released gas from Tank 241-SY-101 are hydrogen, nitrous oxide, nitrogen, ammonia, carbon monoxide, and methane. A mitigation strategy that may effectively reduce the retention and release of these gases and the release of flammable gases is dilution coupled with eating of the tank wastes. The purpose of this work was to determine changes in rheological and physical properties caused by heating and dilution of actual 241-SY-101 waste. In May and December 1991, following periodic gas releases, samples of the waste in Tank 241-SY-101 were obtained. Current work quantified the effects of heating coupled with NaOH dilution of a combination of waste samples from Tank 241-SY-101 characteristic of a non-convective layer. The experimental approach and results of this heating and dilution study on Tank 241-SY-101 waste samples are described in Sections 2 and 3, respectively. In Section 3.1, a discussion of the rheological properties of the waste as a function of shearing forces, volume percent dilution, and temperature is presented. In Section 3.2, the physical properties of the waste dilutions

are described, including the densities of the slurry, filtered solids, and filtrate; the settling behavior; and the percent filtered solids in the composite sample and each of the composite dilutions. A brief discussion of the results and uncertainties is given in Section 3.3. The conclusions of this investigation are reported in Section 4.

998 (PNL-10370) 324 Radiochemical engineering cells and high level vault tanks mixed waste compliance status. Pacific Northwest Lab., Richland, WA (United States). 29 Dec 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005398. Source: OSTI; NTIS; INIS; GPO Dep.

The 324 Building in the Hanford 300 Area contains Radiochemical Engineering Cells and High Level Vault tanks (the "REC/HLV") for research and development activities involving radioactive materials. Radioactive mixed waste within this research installation, found primarily in B-Cell and three of the high level vault tanks, is subject to RCRA/DWR ("RCRA") regulations for storage. This white paper provides a baseline RCRA compliance summary of MW management in the REC/HLV, based on best available knowledge. The REC/HLV compliance project, of which this paper is a part, is intended to achieve the highest degree of compliance practicable given the special technical difficulties of managing high activity radioactive materials, and to assure protection of human health and safety and the environment. The REC/HLV was constructed in 1965 to strict standards for the safe management of highly radioactive materials. Mixed waste in the REC/HLV consists of discarded tools and equipment, dried feed stock from nuclear waste melting experiments, contaminated particulate matter, and liquid feed stock from various experimental programs in the vault tanks. B-Cell contains most of these materials. Total radiological inventory in B-Cell is estimated at 3 MCi, about half of which is potentially "dispersible", that is, it is in small pieces or mobile particles. Most of the mixed waste currently in the REC/HLV was generated or introduced before mixed wastes were subjected to RCRA in 1987.

999 (PNL-10490) Thermal and combined thermal and radiolytic reactions involving nitrous oxide, hydrogen, and nitrogen in the gas phase; comparison of gas generation rates in supernate and solid fractions of Tank 241-SY-101 simulated waste. Bryan, S.A.; Pederson, L.R. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008627. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes progress made in evaluating means by which flammable gases are generated in Hanford double-shell tank wastes, based on the results of laboratory tests using simulated waste mixtures. Work described in this report was conducted at Pacific Northwest Laboratory (PNL) for the Flammable Gas Safety Project, the purpose of which is to develop information needed to support Westinghouse Hanford Company (WHC) in their efforts to ensure the safe interim storage of wastes at the Hanford Site. This work is related to gas generation studies being performed at Georgia Institute of Technology (GIT), under subcontract to PNL, using simulated wastes, and to studies being performed at VMC using actual wastes.

1000 (PNL-10503) Computer simulation of mobilization and mixing of kaolin with submerged liquid jets in 25,000-gallon horizontal cylindrical tanks. Eyler, L.L.;

Mahoney, L.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009570. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents and analyzes results of computer model simulation of mobilization and mixing of kaolin using the TEMPEST code. The simulations are conducted in a horizontal cylindrical geometry replicating a 95 m³ (25,000 gal) test tank at ORNL, which is scaled to approximate Melton Valley Storage tanks, which are 190 m³ (50,000 gal). Mobilization and mixing is accomplished by two submerged liquid jets. Two configurations are simulated, one with the jets located at the center of the tank lengthwise and one with the jets located 1/4 tank length from one end. Computer simulations of both jet and suction configurations are performed. Total flow rates of 50, 100, and 200 gpm are modeled, corresponding to jet velocities of 1.52, 3.05, 6.10 m/s (5, 10, 20 ft/s). Calculations were performed to a time of 2 h for the center jet location and to a little over 1 h for the quarter jet location. This report presents computer and fluid properties model basis, preliminary numerical testing, and results. The results are presented in form of flow field and sludge layer contours. Degree of mobilization is presented as fraction of initial sludge layer remaining as a function of time. For the center jet location at 200 gpm, the sludge layer is completely mobilized in just over 1 h. For 100 gpm flow, about 5% of the sludge layer remains after 2 h. For 50 gpm flow, nearly 40% of the initial sludge layer remains after 2 h. For the quarter jets at 200 gpm, about 10% of the initial sludge layer remains after 1 h. For 100 gpm, about 40% of the sludge layer remains after 1 h. The boundary of the sludge layer is defined as 98% max packing for the particles. Mixing time estimates for these cases range from between 9.4 h and 16.2 h. A more critical evaluation and comparison of predictions and the test results is needed.

1001 (PNL-10512) Sludge pretreatment chemistry evaluation: Enhanced sludge washing separation factors. Colton, N.G. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010325. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the work conducted in Fiscal Year 1994 by the Sludge Pretreatment Chemistry Evaluation Subtask for the Tank Waste Remediation System (TWRS) Tank Waste Treatment Science Task. The main purpose of this task, is to provide the technical basis and scientific understanding to support TWRS baseline decisions and actions, such as the development of an enhanced sludge washing process to reduce the volume of waste that will require high-level waste (HLW) vitrification. One objective within the Sludge Pretreatment Chemistry Evaluation Subtask was to establish wash factors for various SST (single-shell tank) sludges. First, analytical data were compiled from existing tank waste characterization reports. These data were summarized on tank-specific worksheets that provided a uniform format for reviewing and comparing data, as well as the means to verify whether the data set for each tank was complete. Worksheets were completed for 27 SST wastes. The analytical water wash data provided tank-specific information about the fraction of each component that dissolves with water, i.e., an estimate of tank-specific wash factors for evaluating tank-by-tank processing. These wash data were then used collectively to evaluate some of the wash factors that are assumed for the overall SST waste inventory;

specifically, wash factors for elements that would be found primarily in sludges. The final step in this study was to incorporate the characterization and wash factor data into a spreadsheet that provides insight into the effect of enhanced sludge washing on individual tank sludges as well as for groups of sludges that may be representative of different waste types. Spreadsheet results include the estimated mass and percentage of each element that would be removed with washing and leaching. Furthermore, estimated compositions are given of the final wash and leach streams and residual solids, in terms of both concentration and dry weight percent.

1002 (PNL-SA-20933) Research and development support of the Hanford site tank waste remediation system. Johnson, B.M. (Pacific Northwest Lab., Richland, WA (United States)); Wodrich, D.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1992. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-920851-99: Spectrum '92: nuclear and hazardous waste management international topical meeting, Boise, ID (United States), 23-27 Aug 1992). Order Number DE95004931. Source: OSTI; NTIS; INIS; GPO Dep.

The research and development of new technology in support of the tank waste remediation system (TWRS) program at Hanford is largely driven by the unique situation with the Hanford radioactive tank wastes. The operational history at Hanford has involved three different major processes and several major campaigns to recover fission products from the wastes, and has not maintained a segregation of the high-level wastes. The result is a very diverse inventory with very high content of solids of many different chemical constituents and great complexity. The R & D program must not only assure that an acceptable strategy for remediation of these wastes can be put in place, it must also define ways of improving the cost effectiveness of the strategy to make the mammoth task more tractable.

1003 (PNL-SA-21497) Characterization of Hanford tank wastes containing ferrocyanides. Tingey, J.M.; Matheson, J.D.; McKinley, S.G.; Jones, T.E.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Feb 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225-126: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE95004561. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, 17 storage tanks on the Hanford site that are believed to contain > 1,000 gram moles (465 lbs) of ferrocyanide compounds have been identified. Seven other tanks are classified as ferrocyanide containing waste tanks, but contain less than 1,000 gram moles of ferrocyanide compounds. These seven tanks are still included as Hanford Watch List Tanks. These tanks have been declared an unresolved safety question (USQ) because of potential thermal reactivity hazards associated with the ferrocyanide compounds and nitrate and nitrite. Hanford tanks with waste containing > 1,000 gram moles of ferrocyanide have been sampled. Extensive chemical, radiothermal, and physical characterization have been performed on these waste samples. The reactivity of these wastes were also studied using Differential Scanning Calorimetry (DSC) and Thermogravimetric analysis. Actual tank waste samples were retrieved from tank 241-C-112 using a specially designed and equipped core-sampling truck. Only a small portion of the

data obtained from this characterization effort will be reported in this paper. This report will deal primarily with the cyanide and carbon analyses, thermal analyses, and limited physical property measurements.

1004 (PNL-SA-22937) Multipurpose optimization models for high level waste vitrification. Hoza, M. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-89: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017797. Source: OSTI; NTIS; INIS; GPO Dep.

Optimal Waste Loading (OWL) models have been developed as multipurpose tools for high-level waste studies for the Tank Waste Remediation Program at Hanford. Using nonlinear programming techniques, these models maximize the waste loading of the vitrified waste and optimize the glass formers composition such that the glass produced has the appropriate properties within the melter, and the resultant vitrified waste form meets the requirements for disposal. The OWL model can be used for a single waste stream or for blended streams. The models can determine optimal continuous blends or optimal discrete blends of a number of different wastes. The OWL models have been used to identify the most restrictive constraints, to evaluate prospective waste pretreatment methods, to formulate and evaluate blending strategies, and to determine the impacts of variability in the wastes. The OWL models will be used to aid in the design of frits and the maximize the waste in the glass for High-Level Waste (HLW) vitrification.

1005 (PNL-SA-23112) Analytical characterization of high-level mixed wastes using multiple sample preparation treatments. King, A.G.; Baldwin, D.L.; Urie, M.W.; McKinley, S.G. Pacific Northwest Lab., Richland, WA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-88: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017799. Source: OSTI; NTIS; INIS; GPO Dep.

The Analytical Chemistry Laboratory at the Pacific Northwest Laboratory in Richland, Washington, is actively involved in performing analytical characterization of high-level mixed waste from Hanford's single shell and double shell tank characterization programs. A full suite of analyses is typically performed on homogenized tank core samples. These analytical techniques include inductively-coupled plasma-atomic emission spectroscopy, total organic carbon methods and radiochemistry methods, as well as many others, all requiring some type of remote sample-preparation treatment to solubilize the tank sludge material for analysis. Most of these analytical methods typically use a single sample-preparation treatment, inherently providing elemental information only. To better understand and interpret tank chemistry and assist in identifying chemical compounds, selected analytical methods are performed using multiple sample-preparation treatments. The sample preparation treatments used at Pacific Northwest Laboratory for this work with high-level mixed waste include caustic fusion, acid digestion, and water leach. The type of information available by comparing results from different sample-prep treatments includes evidence for the presence of refractory compounds, acid-soluble compounds, or water-soluble compounds. Problems unique to the analysis of Hanford tank wastes are

discussed. Selected results from the Hanford single shell ferrocyanide tank, 241-C-109, are presented, and the resulting conclusions are discussed.

1006 (PNL-SA-23790) Finite element modelling of an evacuated canister for removal of molten radioactive glass. Hatchell, B.K.; Deibler, J.E.; Ketner, G.L. Pacific Northwest Lab., Richland, WA (United States). May 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9405186-1: 6. international ANSYS conference, Pittsburgh, PA (United States), 2-6 May 1994). Order Number DE94014496. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) has prepared a preliminary design for the West Valley Demonstration Project evacuated canister system. The function of the evacuated canister is to remove radioactive molten glass from a hot cell melter cavity during a planned melter shutdown. The proposed evacuated canister system consists of an L-shaped 4-inch 304L stainless steel (SS) schedule 40 pipe, sealed at one end with an aluminum plug and attached at the other end to a canister. While the canister is being filled, it is positioned and held above the melter at approximately 15° from horizontal by two turntable-mounted cranes. ANSYS finite element analyses were conducted to evaluate the heat transfer from the glass to the canister and establish a maximum canister temperature for material strength evaluation. Finite element structural analyses were conducted to identify areas that required reinforcement for high temperature use. Finite element results will be used to locate strain gauges at high stress locations during prototype testing.

1007 (PNL-SA-23850) Data quality objectives process applied to characterization of Hanford tanks containing ferrocyanide. Pulsipher, B.A. (Pacific Northwest Lab., Richland, WA (United States)); Anderson, C.M.; Buck, J.W.; Cash, R.J.; Dukelow, G.T.; Meacham, J.E. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-81: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017460. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1944, underground storage tanks located at the Hanford Site in Richland, Washington, have stored approximately 277,000 m³ (60 Mgal) of highly radioactive and non-radioactive wastes. Recently, a number of safety issues have arisen concerning these tanks, with regard to worker and public health. The US Department of Energy (DOE) has made the resolution of these safety concerns its number one priority at the Hanford Site. The safety program of the Tank Waste Remediation System (TWRS) was developed to provide an integrated approach to resolution of these waste tank safety issues and safety concerns. The Characterization Program within TWRS is responsible for characterizing the wastes contained in the tanks. To ensure that characterization activities provide data that will be adequate to resolve safety concerns, the Data Quality Objectives (DQO) process is being implemented.

1008 (PNL-SA-23865) Noble metal catalyzed hydrogen generation from formic acid in nitrite-containing simulated nuclear waste media. King, R.B. (Univ. of Georgia, Athens, GA (United States). Department of Chemistry); Bhattacharyya, N.K.; Wiemers, K.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 37p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940807-1: 9. international symposium on homogeneous catalysis, Jerusalem (Israel), 21-26 Aug 1994). Order Number DE94018724. Source: OSTI; NTIS; INIS; GPO Dep.

Simulants for the Hanford Waste Vitrification Plant (HWVP) feed containing the major non-radioactive components Al, Cd, Fe, Mn, Nd, Ni, Si, Zr, Na, CO_3^{2-} , NO_3^- , and NO_2^- were used as media to evaluate the stability of formic acid towards hydrogen evolution by the reaction $\text{HCO}_2\text{H} \rightarrow \text{H}_2 + \text{CO}_2$ catalyzed by the noble metals Ru, Rh, and/or Pd found in significant quantities in uranium fission products. Small scale experiments using 40-50 mL of feed simulant in closed glass reactors (250-550 mL total volume) at 80-100°C were used to study the effect of nitrite and nitrate ion on the catalytic activities of the noble metals for formic acid decomposition. Reactions were monitored using gas chromatography to analyze the CO_2 , H_2 , NO , and N_2O in the gas phase as a function of time. Rhodium, which was introduced as soluble $\text{RhCl}_3 \cdot 3\text{H}_2\text{O}$, was found to be the most active catalyst for hydrogen generation from formic acid above 80°C in the presence of nitrite ion in accord with earlier observations. The inherent homogeneous nature of the nitrite-promoted Rh-catalyzed formic acid decomposition is suggested by the approximate pseudo first-order dependence of the hydrogen production rate on Rh concentration. Titration of the typical feed simulants containing carbonate and nitrite with formic acid in the presence of rhodium at the reaction temperature ($\approx 90^\circ\text{C}$) indicates that the nitrite-promoted Rh-catalyzed decomposition of formic acid occurs only after formic acid has reacted with all of the carbonate and nitrite present to form CO_2 and $\text{NO}/\text{N}_2\text{O}$, respectively. The catalytic activities of Ru and Pd towards hydrogen generation from formic acid are quite different than those of Rh in that they are inhibited rather than promoted by the presence of nitrite ion.

1009 (PNL-SA-23952) **A chemical model for the major electrolyte components of the Hanford waste tanks. The binary electrolytes in the system: $\text{Na-NO}_3\text{-NO}_2\text{-SO}_4\text{-CO}_3\text{-F-PO}_4\text{-OH-Al(OH)}_3\text{-H}_2\text{O}$.** Felmy, A.R.; Rustad, J.R.; Mason, M.J.; Bretonne, R. de la. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9408168-3: American Chemical Society symposium on scientific issues related to safety treatment of waste tanks, Atlanta, GA (United States), 21-26 Aug 1994). Order Number DE95004957. Source: OSTI; NTIS; INIS; GPO Dep.

An aqueous thermodynamic model is developed, based on the equations of Pitzer, which accurately model the major binary electrolytes in the $\text{Na-NO}_3\text{-NO}_2\text{-SO}_4\text{-CO}_3\text{-F-PO}_4\text{-OH-Al(OH)}_3\text{-H}_2\text{O}$ chemical system. This model was developed both from existing data in the literature, and from new osmotic and solubility measurements made as part of this study. Some of the new experimental data developed as part of this study include measurements of osmotic coefficients for NaNO_3 , NaNO_2 , and Na_3PO_4 at both 50 and 100°C as well as selected measurements of NaF at 100°C. In addition, the solubility of gibbsite was measured in mixed NaOH-NaNO_3 solutions to determine the reliability of existing thermodynamic models of aluminum hydroxide solubility when applied to concentrated nitrate. In general the final model proposed here is valid from dilute solution to salt saturation over the temperature range 25-100°C. The accuracy

of the model is tested by comparisons of the model predictions with experimental data in selected common-ion ternary systems. When necessary a few commonion ternary ion interaction parameters for the Pitzer model were developed.

1010 (PNL-SA-24027) **The solubility of $\text{Cr(OH)}_3(\text{am})$ in concentrated NaOH and NaOH-NaNO_3 solutions.** Felmy, A.R.; Rai, D.; Fulton, R.W. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9408168-2: American Chemical Society symposium on scientific issues related to safety treatment of waste tanks, Atlanta, GA (United States), 21-26 Aug 1994). Order Number DE95004559. Source: OSTI; NTIS; INIS; GPO Dep.

Chromium is a major component of the Hanford waste tank sludges, and the presence of Cr in the sludges is a significant concern in the disposal of these sludges because Cr can interfere with the formation of waste glasses. One of the current pretreatment strategies for removing constituents that can interfere with glass formation, such as P and Cr, is to wash/dissolve the sludges in basic NaOH solutions. The solubility of $\text{Cr(OH)}_3(\text{am})$ was measured in concentrated NaOH ranging in concentration from 0.1M to 6.0M and in NaOH-NaNO_3 solutions with fixed NaOH concentration and variable NaNO_3 concentration at room temperature (22-23°C). Equilibrium between solids and solutions was approached relatively slowly and required approximately 60-70 days before steady-state concentrations were reached. A thermodynamic model, based upon the Pitzer equations, was developed from the solubility data in NaOH , which includes only two aqueous Cr species (Cr(OH)_4^- and $\text{NaCr(OH)}_4(\text{aq})$) and ion-interaction parameters for Na^+ with Cr(OH)_4^- . This model was then tested in the mixed NaOH-NaNO_3 solutions and found to be reliable.

1011 (PNL-SA-24065) **Potential gas releases from the bottom sludge layer.** Stewart, C.W. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9404186-1: Tank waste chemical reactions meeting, Richland, WA (United States), 11 Apr 1994). Order Number DE94014498. Source: OSTI; NTIS; INIS; GPO Dep.

A layer of sludge about 50 inches deep may exist at the bottom of the tank that has not been mixed by the pump. This bottom sludge layer may be accumulating gas at a rate of 23 SCF/day, resulting in a basal level rise of 0.025 inches/day. At some point sufficient gas may accumulate to release spontaneously. Using reasonable assumptions about gas generation, waste properties and the mechanics of the release process, this may result in gas releases on the order of 1, 000 SCF.

1012 (PNL-SA-24429) **Jet mixer pump testing in Hanford Tank 241-SY-101.** Stewart, C.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941102-39: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95007797. Source: OSTI; NTIS; GPO Dep.

A mixer pump was found effective in controlling and possibly eliminating large episodic flammable gas releases from Hanford Tank 241-SY-101. A gas release event (GRE) is initiated when the gas-bearing sludge layer accumulates sufficient gas to become buoyant. The buoyant sludge pulls

free from the surrounding material and rises through the surface crust releasing the trapped gas to the dome space. Mixer pump operation is intended to keep enough of the gas-generating material in suspension so that it releases gas continuously instead of periodically in large, potentially dangerous GREs. A mixer pump was installed in the tank on July 3, 1993, seven days after a typical GRE that met the safety criteria for pump installation. Because nozzle plugging did occur, bump speed and duration were increased, eventually arriving at the accepted five-minute period at 1000 rpm on July 26. There has been no nozzle plugging since. Bumping was initially performed twice daily through mid-August and once daily until the start of Phase B testing. By the end of Phase B, thrice-weekly bumping during non-testing periods became the rule. The jets were aimed into previously undisturbed material and gas release induced by the pump increased immediately. In November, the pump was indexed progressively around the entire tank in 30° steps. This steadily released a large quantity of retained gas at each position and reduced the waste level to 400 inches, the minimum level in many years. By December, the jets had apparently excavated most of the gas-bearing sludge within reach, because only modest gas releases and essentially no level change occurred after pump operation. For the rest of Phase B testing, there were no large gas releases that would suggest a large volume of unmixed waste. The two thermocouple trees showed a uniform vertical temperature profile. In the month following Phase B, minimal pump operation apparently maintained most of the mixing achieved during testing.

1013 (PNL-SA-24448) Analysis of radioactive mixed hazardous waste using derivatization gas chromatography/mass spectrometry, liquid chromatography, and liquid chromatography/mass spectrometry. Campbell, J.A.; Lerner, B.D.; Bean, R.M.; Grant, K.E.; Lucke, R.B.; Mong, G.M.; Clauss, S.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-95: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94018917. Source: OSTI; NTIS; INIS; GPO Dep.

Six samples of core segments from Tank 101-SY were analyzed for chelators, chelator fragments, and several carboxylic acids by derivatization gas chromatography/mass spectrometry. The major components detected were ethylenediaminetetraacetic acid, nitroso-iminodiacetic acid, nitrilotriacetic acid, citric acid, succinic acid, and ethylenediaminetriacetic acid. The chelator of highest concentration was ethylenediaminetetraacetic acid in all six samples analyzed. Liquid chromatography was used to quantitate low molecular weight acids including oxalic, formic, glycolic, and acetic acids, which are present in the waste as acid salts. From 23 to 61% of the total organic carbon in the samples analyzed was accounted for by these acids.

1014 (PNL-SA-24498) Radiation effects issues related to US DOE site remediation and nuclear waste storage. Weber, W.J. (Pacific Northwest Lab., Richland, WA (United States)); Ewing, R.C. Pacific Northwest Lab., Richland, WA (United States); Cornell Univ., Ithaca, NY (United States). Dept. of Chemistry. Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941075-6: 18. international

symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE95003152. Source: OSTI; NTIS; INIS; GPO Dep.

Site restoration activities at DOE facilities and the permanent disposal of nuclear waste generated at the same DOE facilities involve working with and within various types and levels of radiation fields. Radionuclide decay and the associated radiation fields lead to physical and chemical changes that can degrade or enhance material properties. This paper reviews the impact of radiation fields on site restoration activities and on the release rate of radionuclides to the biosphere from nuclear waste forms.

1015 (PNL-SA-24741) Analysis of radioactive waste samples by ion chromatography-ICP/MS. Farmer, O.T. III; Reeves, J.H.; Wyse, E.J.; Clemeston, C.J.; Barinaga, C.J.; Smith, M.R.; Koppenaal, D.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9410147-3: 35. ORNL/DOE analytical chemistry in energy technology conference, Gatlinburg, TN (United States), 6-8 Oct 1994). Order Number DE95004936. Source: OSTI; NTIS; INIS; GPO Dep.

A comprehensive ion chromatography (IC) with beta-counting (beta) and inductively coupled plasma mass spectrometry (ICP/MS) detection approach has been developed to separate and detect 20 radionuclides in a Hanford waste tank sample. The IC separation was performed using a multi-functional group (anion/cation) resin and eluents of oxalic acid, diglycolic acid, and hydrochloric acid. Shorter-lived radionuclides were detected by a solid-state beta scintillation counter on-line with the IC separation. Mass spectrometry detection using an efficient and robust plasma ionization source provides isotopic discernability for both stable isotopes and long-lived radioactive species. Effective separation of over 47 elements and 160 isotopes was obtained from a single-elution scheme lasting 70 min. Automated IC separations provide the potential for rapid isotopic and radionuclide analysis of complex radioactive waste, using minimal sample and reagent volumes and reducing personnel exposures.

1016 (PNL-SA-24849) Low temperature hydrothermal destruction of organics in Hanford tank wastes. Orth, R.J.; Elmore, M.R.; Zacher, A.H.; Neuenschwander, G.G.; Schmidt, A.J.; Jones, E.O.; Hart, T.R.; Poshusta, J.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940813-23: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE94018720. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this work is to evaluate and develop a low temperature hydrothermal process (HTP) for the destruction of organics that are present wastes temporarily stored in underground tanks at the Hanford Site. Organic compounds contribute to tank waste safety issues, such as hydrogen generation. Some organic compounds act as complexants, promoting the solubility of radioactive constituents such as ⁹⁰Sr and ²⁴¹Am, which is undesirable for waste pretreatment processing. HTP is thermal-chemical autogenous processing method that is typically operated between 250°C and 375°C and approximately 200 atm. Testing with simulated tank waste, containing a variety of organics has been performed. The distribution of strontium, cesium and bulk metals between the supernatant and solid phases as a function of the total organic content of the waste simulant will be

presented. Test results using simulant will be compared with similar tests conducted using actual radioactive waste.

1017 (PNL-SA-24951) Risk-based systems analysis for emerging technologies: Applications of a technology risk assessment model to public decision making. Quadrel, M.J. (Pacific Northwest Lab., Richland, WA (United States)); Fowler, K.M.; Cameron, R.; Treat, R.J.; McCormack, W.D.; Cruse, J. Pacific Northwest Lab., Richland, WA (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940216-89: Nondestructive assay and nondestructive examination waste characterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE95008959. Source: OSTI; NTIS; INIS; GPO Dep.

The risk-based systems analysis model was designed to establish funding priorities among competing technologies for tank waste remediation. The model addresses a gap in the Department of Energy's (DOE's) "toolkit" for establishing funding priorities among emerging technologies by providing disciplined risk and cost assessments of candidate technologies within the context of a complete remediation system. The model is comprised of a risk and cost assessment and a decision interface. The former assesses the potential reductions in risk and cost offered by new technology relative to the baseline risk and cost of an entire system. The latter places this critical information in context of other values articulated by decision makers and stakeholders in the DOE system. The risk assessment portion of the model is demonstrated for two candidate technologies for tank waste retrieval (arm-based mechanical retrieval - the "long reach arm") and subsurface barriers (close-coupled chemical barriers). Relative changes from the base case in cost and risk are presented for these two technologies to illustrate how the model works. The model and associated software build on previous work performed for DOE's Office of Technology Development and the former Underground Storage Tank Integrated Demonstration, and complement a decision making tool presented at Waste Management 1994 for integrating technical judgements and non-technical (stakeholder) values when making technology funding decisions.

1018 (PNL-SA-25649) A Value of Information approach to data quality objectives for the Hanford high-level waste tanks. Wood, T.W. (Pacific Northwest Lab., Richland, WA (United States)); Hunter, V.L.; Ulvila, J.W. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-117: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008936. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes a Pacific Northwest Laboratory review of the organic-nitrate reaction safety issue in the Hanford single-shell tanks. This study employed a decision analytic method known as Value of Information (VOI). VOI analysis is a special form of decision analysis that has an information collection alternative as one of the initial decision choices. This type of decision analysis, therefore results in the ability to specify the preferred information collection alternative, taking into account all information gathering and other relevant alternatives. For example, the risk reduction benefit associated with further sampling to quantify total organic carbon inventory or to improve information on energetics can be compared to the risk reduction benefit of better temperature monitoring, operational restrictions, or

mitigation by moisture control. This approach allows freedom from built-in assumptions, e.g., that all tanks must be sampled to some degree or that all tanks must be deemed intrinsically safe by some means or another. It allows for each tank management decision to be judged in terms of risk reduction from the current state of affairs, and for that state of affairs to be continuously updated to incorporate new information on tank contents, the phenomenology of safety issues, or the effectiveness of mitigation schemes.

1019 (SD-WM-TI-230-Rev.2) As-built design criteria: B-234 cathodic protection, C.P. wire to pipe connections. Brezler, T.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Nov 1994. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003762. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the as-built conditions (cathodic protection wire connections to miscellaneous underground piping) that do not otherwise exist on the current "Released for Construction" design drawings. A note will be added to each applicable drawing, referencing this support document.

1020 (UCRL-ID-110052) Closure report for underground storage tank 161-R1U1 and its associated underground piping. Mallon, B.J.; Blake, R.G. Lawrence Livermore National Lab., CA (United States). May 1994. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94014943. Source: OSTI; NTIS; INIS; GPO Dep.

Underground storage tank (UST) 161-31 R at the Lawrence Livermore National Laboratory (LLNL) was registered with the State Water Resources Control Board on June 27, 1984. UST 161-31R was subsequently renamed UST 161-R1U1 (Fig. A-1, Appendix A). UST 161-R1U1 was installed in 1976, and had a capacity of 383 gallons. This tank system consisted of a fiberglass reinforced plastic tank, approximately 320 feet of polyvinyl chloride (PVC) underground piping from Building 161, and approximately 40 feet of PVC underground piping from Building 160. The underground piping connected laboratory drains and sinks inside Buildings 160 and 161 to UST 161-R1U1. The wastewater collected in UST 161-R1U1, contained organic solvents, metals, inorganic acids, and radionuclides, most of which was produced within Building 161. On June 28, 1989, the UST 161-R1U1 piping system around the perimeter of Building 161 failed a precision test performed by Gary Peters Enterprises (Appendix B). The 161-R1U1 tank system was removed from service after the precision test. In July 1989, additional hydrostatic tests and helium leak detection tests were performed (Appendix B) to determine the locations of the piping failures in the Building 161 piping system. The locations of the piping system failures are shown in Figure A-2 (Appendix A). On July 11, 1989, LLNL submitted an Unauthorized Release Report to Alameda County Department of Environmental Health (ACDEH), Appendix C.

1021 (UCRL-ID-111766) Closure report for underground storage tanks 321-I1U1, 321-I1U2, and 321-I1U3 and associated underground piping. Mallon, B.J.; Blake, R.G. Lawrence Livermore National Lab., CA (United States). May 1994. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94014352. Source: OSTI; NTIS; GPO Dep.

Underground storage tanks (USTs) 321-I1U1, 321-I1U2, and 321-I1U3, located in the Building 321 area at Lawrence Livermore National Laboratory (LLNL) (Fig. A-1 and A-2,

Appendix A), were registered with the State Water Resources Control Board as USTs 321A-11X, 321A-12X, and 321A-13X and were subsequently renamed. This tank system consisted of three polyvinyl chloride (PVC) lined concrete sumps and approximately 400 ft of underground 4 in. PVC piping (Fig. A-2, Appendix A). Sumps 321-IIU1 and 321-IIU3 each had a capacity of 3,000 gal, and tank 321-IIU2 had a capacity of 3,700 gal. These sumps were constructed in 1974 and were used to receive waste rinse-water containing acids, metals, and possibly some organic solvents from the plating shop operations at Building 322. Sump 321-IIU3 received the rinsewater from Building 322. Sump 321-IIU2 received the acidic backwash, and sump 321-IIU1 received the caustic backwash from the ion-exchange columns. The sumps remained in service until January 1986. In 1988, the sumps were cleaned and decontaminated in preparation for closure.

1022 (UCRL-ID-117120) Decision and systems analysis for underground storage tank waste retrieval systems and tank waste remediation system. Bitz, D.A. (Independent Consultant, Kirkland, WA (United States)); Berry, D.L.; Jardine, L.J. Lawrence Livermore National Lab., CA (United States). Mar 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95004196. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford's underground tanks (USTs) pose one of the most challenging hazardous and radioactive waste problems for the Department of Energy (DOE). Numerous schemes have been proposed for removing the waste from the USTs, but the technology options for doing this are largely unproven. To help assess the options, an Independent Review Group (IRG) was established to conduct a broad review of retrieval systems and the tank waste remediation system. The IRG consisted of the authors of this report.

1023 (UCRL-ID-118926) Conceptual design of a Raman probe for inclusion in the in-tank cone penetrometer. Kyle, K.R. Lawrence Livermore National Lab., CA (United States). 30 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006431. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, tank wastes are to be characterized by drilling and physically removing core samples. The cores are analyzed in laboratories in a hot cell environment. The purpose of the cone penetrometer is to bring the interrogative methods to the sample in its native environment, providing faster, safer, and more cost effective tank characterization, both in terms of time and effort. Probes currently exist for the physical characterization of tank wastes in terms of porosity, density, temperature, and electrical conductivity. The main tool for chemical analysis in the in-tank cone penetrometer will be a fiber optic Raman spectroscopy probe, which will be used to collect information about the molecular chemical constituents of the tank wastes. This report addresses the design and implementation of a Raman probe with the in-tank cone penetrometer. The scope of this document includes design specifications and recommendations for the following aspects of the in-tank Raman cone penetrometer probe: cone penetrometer probe interface—an unit for the inclusion of a Raman probe in the in-tank cone penetrometer will be described; window materials—chemically resistant and mechanically stable materials for the cone penetrometer

probe interface window will be considered; Raman probes—Raman probes for inclusion in the penetrometer will be discussed.

1024 (WHC-EP-0182-71) Tank Farm surveillance and waste status summary report for February 1994. Hanlon, B.M. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014581. Source: OSTI; NTIS; GPO Dep.

This report is the official inventory for radioactive waste stored in underground tanks in the 200 Areas at the Hanford Site. Data that depict the status of stored radioactive waste and tank vessel integrity are contained within the report. This report provides data on each of the existing 177 large underground waste storage tanks and 49 smaller catch tanks and special surveillance facilities, and supplemental information regarding tank surveillance anomalies and ongoing investigations. This report is intended to meet the requirement of US Department of Energy Richland Operations Office Order 5820.2A, Chapter 1, Section 3.e. (3) (DOE-RL, 1990, Radioactive Waste Management, US Department of Energy-Richland Operation Office, Richland, Washington) requiring the reporting of waste inventories and space utilization for Hanford Tank Farm Tanks.

1025 (WHC-EP-0182-74) Tank farm surveillance and waste status summary report for May 1994. Hanlon, B.M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 157p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019038. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the official inventory for radioactive waste stored in underground tanks in the 200 Areas at the Hanford Site. Data that depict the status of stored radioactive waste and tank vessel integrity are contained within the report. This report provides data on each of the existing 177 large underground waste storage tanks and 49 smaller catch tanks and special surveillance facilities, and supplemental information regarding tank surveillance anomalies and ongoing investigations. This report is intended to meet the requirement of US Department of Energy-Richland Operations Office Order 5820.2A, Chapter 1, Section 3.e. (3) (DOE-RL, 1990, Radioactive Waste Management, US Department of Energy-Richland Operation Office, Richland, Washington) requiring the reporting of waste inventories and space utilization for Hanford Tank Farm Tanks.

1026 (WHC-EP-0407-Rev.2) Action plan for response to abnormal conditions in Hanford Site radioactive waste tanks containing ferrocyanide: Revision 2. Fowler, K.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016473. Source: OSTI; NTIS; INIS; GPO Dep.

This action plan describes the administrative controls, monitoring frequencies, monitoring criteria, and reporting requirements that have been implemented for the Ferrocyanide Watch List tanks. In addition, corrective actions have been outlined where a response to an abnormal condition in a Ferrocyanide Watch List tank is warranted. Such responses may be due to changes in tank temperatures or pressures; flammable or toxic vapor concentrations, or airborne radiation levels. Additionally, this plan identifies source documents that detail the following: the criteria and specification limits required for ensuring that Ferrocyanide Watch

List tanks are maintained in a SAFE or CONDITIONALLY SAFE state; response actions for prevention or mitigation of the consequences of an abnormal condition; and organizational responsibilities for ensuring that ferrocyanide tanks are maintained in a SAFE or CONDITIONALLY SAFE state and for responding to abnormal conditions.

1027 (WHC-EP-0431-Rev.1) **Underground storage tank - Integrated Demonstration Technical Task Plan master schedule.** Johnson, C.M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019057. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an integrated programmatic schedule (i.e., Master Schedule) for the U.S. Department of Energy (DOE) Underground Storage Tank-Integrated Demonstration (UST-ID) Program. It includes top-level schedule and related information for the DOE Office of Technology Development (EM-50) UST-ID activities. The information is based upon the fiscal year (FY) 1994 technical task plans (TTPS) and has been prepared as a baseline information resource for program participants. The Master Schedule contains Level 0 and Level 1 program schedules for the UST-ID Program. This document is one of a number of programmatic documents developed to support and manage the UST-ID activities. It is composed of the following sections: Program Overview - provides a summary background of the UST-ID Program. This summary addresses the mission, scope, and organizational structure of the program; Activity Description - provides a programmatic description of UST-ID technology development activities and lists the key milestones for the UST-ID systems. Master Schedules - contains the Level 0 and Level 1 programmatic schedules for the UST-ID systems. References - lists the UST-ID programmatic documents used as a basis for preparing the Master Schedule. The appendixes contain additional details related to site-specific technology applications.

1028 (WHC-EP-0473-Rev.1) **Action plan for response to excessive temperature in high heat source waste tank 241-C-106 at the Hanford site: Revision 1.** DeFigh-Price, C.; Wang, O.S. Westinghouse Hanford Co., Richland, WA (United States). Jun 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016476. Source: OSTI; NTIS; INIS; GPO Dep.

This action plan identifies the responses that shall be implemented if anomalies in temperature measurements, or conditions that could lead to temperature anomalies (such as a leaking tank), are observed in tank 241-C-106 of the Hanford site C Tank Farm. This plan also summarizes (1) the criteria and specification limits required for ensuring that tank 241-C-106 is maintained in a safe condition; (2) the responsible organizations for tank 241-C-106; and (3) response actions to prevent or mitigate safety concerns. The main safety concern unique to tank 241-C-106 is the temperature rise due to heat generation by the waste content.

1029 (WHC-EP-0473-Rev.2) **Action plan for response to excessive temperatures in Hanford Site High-Heat Waste Tank 241-C-106. Revision 2.** Wang, O.S. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010200. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-C-106 is one of eight high-heat tanks at the Hanford Site in south central Washington State, and is the only tank on Hanford's High-Heat Tank Watch List. This action plan defines possible abnormal conditions (such as ventilation system failure and leaking tank) that could lead to excessive temperature increase in tank 241-C-106, and documents pre-planned contingency actions that would effectively mitigate the consequences of such increased temperatures. Potential structural damage may result from high temperatures caused by inadequate cooling. Tank 241-C-106 contains a significant amount of high-heat radioactive waste, mainly strontium, and requires forced ventilation in combination with evaporation for adequate cooling. Forced ventilation at 2,500 ft³/min, along with water addition at a rate near 6,000 gal/month, is currently being administered to maintain cooling of the tank. This action plan addresses high-heat concerns and corrective measures unique to tank 241-C-106. Other general emergency actions for the 200 Area Tank Farms, such as those for fires and earthquakes, are described in WHC-CM-4-43, "Emergency Management Procedures" and are not included in this document. Tank 241-C-106 is presently a non-leaking tank. If tank 241-C-106 were to leak, maintaining current cooling water levels would result in continual water loss to the ground and further environmental damage. If cooling water additions to the tank are stopped in the event of a leak, the sludge could heat to temperatures greater than established safety limits and could cause tank structural damage. A Tri-Party Agreement milestone and a Department of Energy Safety Initiative milestone have been established to start waste retrieval from tank 241-C-106 in October 1996.

1030 (WHC-EP-0474-10) **Quarterly report on Defense Nuclear Facilities Safety Board recommendation 90-7 for the period ending September 30, 1993.** Meacham, J.E.; Cash, R.J.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Dec 1993. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014635. Source: OSTI; NTIS; GPO Dep.

This is the tenth quarterly report on the progress of activities addressing safety issues associated with Hanford Site high-level radioactive waste tanks that contain ferrocyanide compounds. In the Presence of oxidizing materials, such as nitrates or nitrites, ferrocyanide can be made to explode in the laboratory by heating it to high temperatures [above 285° C (545° F)]. In the mid 1950s, approximately 140 metric tons of ferrocyanide were added to waste now stored in underground high-level radioactive waste tanks. An implementation plan responding to the Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990)² was issued in March 1991 describing the activities that were planned and underway to address each of the six parts of Recommendation 90-7. A revision to the original plan was transmitted to the US Department of Energy by Westinghouse Hanford in December 1992, and subsequently to the Defense Nuclear Facilities Safety Board in 1993.

1031 (WHC-EP-0474-13) **Quarterly report on the Ferrocyanide Safety Program for the period ending June 30, 1994.** Meacham, J.E.; Cash, R.J.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016463. Source: OSTI; NTIS; GPO Dep.

This is the thirteenth quarterly report on the progress of activities addressing the Ferrocyanide Safety Issue associated With Hanford site high-level radioactive waste tanks. Progress in the Ferrocyanide Safety Program is reviewed, including work addressing the six parts of Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990). All work activities are described in the revised program plan (Borsheim et al. 1993), and this report follows the same format presented there. A summary of the key events occurring this quarter is presented in Section 1.2. More detailed discussions of progress are located in Sections 3.0 and 4.0.

1032 (WHC-EP-0474-14) Quarterly report on the Ferrocyanide Safety Program for the period ending September 30, 1994. Meacham, J.E.; Cash, R.J.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003267. Source: OSTI; NTIS; GPO Dep.

This is the fourteenth quarterly report on the progress of activities addressing the Ferrocyanide Safety Issue associated with Hanford Site high-level radioactive waste tanks. Progress in the Ferrocyanide Safety Program is reviewed, including work addressing the six parts of Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990). All work activities are described in the revised program plan, and this report follows the same format presented there. A summary of the key events occurring this quarter is presented in Section 1.2. More detailed discussions of progress are located in Sections 3.0 and 4.0.

1033 (WHC-EP-0474-15) Quarterly report on the ferrocyanide safety program for the period ending December 31, 1994. Meacham, J.E.; Cash, R.J.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008033. Source: OSTI; NTIS; INIS; GPO Dep.

This is the fifteenth quarterly report on the progress of active addressing the Ferrocyanide Safety Issue associated with Hanford Site high-level radioactive waste tanks. Progress in the Ferrocyanide Safety Program is reviewed, including work addressing the six parts of Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990). All work activities are described in the revised program plan (DOE 1994b), and this report follows the same format presented there. A summary of the key events occurring this quarter is presented in Section 1.2. More detailed discussions of progress are located in Sections 2.0 through 4.0. 60 refs.

1034 (WHC-EP-0532-Rev.2) High-heat tank safety issue resolution program plan. Revision 2. Wang, O.S. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005054. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this program plan is to provide a guide for selecting corrective actions that will mitigate and/or remediate the high-heat waste tank safety issue for single-shell tank 241-C-106. The heat source of approximately 110,000 Btu/hr is the radioactive decay of the stored waste material (primarily ⁹⁰Sr) inadvertently transferred into the tank in the later 1960s. Currently, forced ventilation, with added water to promote thermal conductivity and evaporation cooling, is used for heat removal. The method is very effective and economical. At this time, the only viable solution identified to

permanently resolve this safety issue is the removal of heat-generating waste in the tank. This solution is being aggressively pursued as the only remediation method to this safety issue, and tank 241-C-106 has been selected as the first single-shell tank for retrieval. The current cooling method and other alternatives are addressed in this program as means to mitigate this safety issue before retrieval. This program plan has three parts. The first part establishes program objectives and defines safety issue, drivers, and resolution criteria and strategy. The second part evaluates the high-heat safety issue and its mitigation and remediation methods and other alternatives according to resolution logic. The third part identifies major tasks and alternatives for mitigation and resolution of the safety issue. A table of best-estimate schedules for the key tasks is also included in this program plan.

1035 (WHC-EP-0562-Rev.1) Program plan for the resolution of tank vapor issues. Osborne, J.W.; Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014579. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1987, workers at the Hanford Site waste tank farms in Richland, Washington, have reported strong odors emanating from the large, underground high-level radioactive waste storage tanks. Some of these workers have complained of symptoms (e.g., headaches, nausea) related to the odors. In 1992, the U.S. Department of Energy, which manages the Hanford Site, and Westinghouse Hanford Company determined that the vapor emissions coming from the tanks had not been adequately characterized and represented a potential health risk to workers in the immediate vicinity of the tanks. At that time, workers in certain areas of the tank farms were required to use full-face, supplied-breathing-air masks to reduce their exposure to the fugitive emissions. While use of supplied breathing air reduced the health risks associated with the fugitive emissions, it introduced other health and safety risks (e.g., reduced field of vision, air-line tripping hazards, and heat stress). In 1992, an aggressive program was established to assure proper worker protection while reducing the use of supplied breathing air. This program focuses on characterization of vapors inside the tanks and industrial hygiene monitoring in the tank farms. If chemical filtration systems for mitigation of fugitive emissions are deemed necessary, the program will also oversee their design and installation. This document presents the plans for and approach to resolving the Hanford Site high-level waste tank vapor concerns. It is sponsored by the Department of Energy Office of Environmental Restoration and Waste Management.

1036 (WHC-EP-0579) SY Tank Farm ventilation isolation option risk assessment report. Powers, T.B.; Morales, S.D. Westinghouse Hanford Co., Richland, WA (United States). Mar 1994. 634p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94011452. Source: OSTI; NTIS; GPO Dep.

The safety of the 241-SY Tank Farm ventilation system has been under extensive scrutiny due to safety concerns associated with tank 101-SY. Hydrogen and other gases are generated and trapped in the waste below the liquid surface. Periodically, these gases are released into the dome space and vented through the exhaust system. This attention to the ventilation system has resulted in the development of

several alternative ventilation system designs. The ventilation system provides the primary means of mitigation of accidents associated with flammable gases. This report provides an assessment of various alternative ventilation system designs.

1037 (WHC-EP-0711) Summary of information on flammable gas watch list tanks. Brager, H.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 712p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016479. Source: OSTI; NTIS; GPO Dep.

This document compiles and summarizes available, relevant information pertaining to Hanford Site waste tanks designated as Flammable Gas Watch List (FGWL) tanks. There are four primary objectives of this document. First, it provides summary data, including surface level readings, chemical composition, and temperature readings for each FGWL tank. This document also is intended to be used as a source of information on FGWL tanks references. More than 400 documents were used to compile the information presented in this report, and the Endnotes at the conclusion of each section; Section 5.0, "References;" and Section 6.0, "Sources of Information" are all included to direct the reader to further, more detailed sources of information that pertain to specific FGWL tanks or information. The third objective of this document is to present the specific fill history of each FGWL double-shell tank (DST), including data obtained from detailed Evaporator 242-A documents. Finally, this document includes an assessment of the total organic carbon (TOC) content of each DST.

1038 (WHC-EP-0729) Ferrocyanide safety program: Thermal analysis of ferrocyanide tanks, Group I. McLaren, J.M. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016478. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to document the results of a series of analyses conducted to the heat loads of the first of two groups of tanks on the Ferrocyanide Watch List. The analyses use the fill/transfer history with a transient solution for the heat load determination. Nominal values of the heat load are determined, as well as the upper lower bounds of the heat load. Ranges of thermal conductivity of the tank waste are determined.

1039 (WHC-EP-0733-Rev.1) High-level waste tank remediation technology integration summary: Revision 1. DeLannoy, C.R. (Enserch Environmental Inc., Bellevue, WA (United States)); Susiene, C.; Fowler, K.M.; Robson, W.M.; Cruse, J.M. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94017983. Source: OSTI; NTIS; INIS; GPO Dep.

Report includes 1 diskette designed to run on IBM PC or compatible equipment.

The U.S. Department of Energy's Environmental Restoration and Waste Management and Technology Development Programs are engaged in a number of projects to develop, demonstrate, test, and evaluate new technologies to support the cleanup and site remediation of more than 300 underground storage tanks containing over 381,000 m³ (100 million gal) of liquid radioactive mixed waste at the Hanford

Reservation. Significant development is needed within primary functions and in determining an overall bounding strategy. This document is an update of continuing work to summarize the overall strategy and to provide data regarding technology development activities within the strategy. It is intended to serve as an information resource to support understanding, decision making, and integration of multiple program technology development activities. Recipients are encouraged to provide comments and input to the authors for incorporation in future revisions.

1040 (WHC-EP-0739) Tank characterization report for Single-Shell Tank 241-BX-107. Raphael, G.F. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 238p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004102. Source: OSTI; NTIS; INIS; GPO Dep.

This study examined and assessed the status, safety issues, composition, and distribution of the wastes contained in the tank 241-BX-107. Historical and most recent information, ranging from engineering structural assessment experiments, process history, monitoring and remediation activities, to analytical core sample data, were compiled and interpreted in an effort to develop a realistic, contemporary profile for the tank BX-107 contents. The results of this study revealed that tank BX-107, a 2,006,050 L (530,000 gal) cylindrical single-shell, dished-bottom carbon-steel tank in the 200 East Area of the Hanford Site, was classified as sound. It has been interim stabilized and thus contains less than 189,250 L (50,000 gal) of interstitial liquid, and less than 18,925 L (5,000 gal) of supernatant. It has also been partially interim isolated, whereby all inlets to the tank are sealed to prevent inadvertent addition of liquid. At a residual waste level of ~3.07 m (120.7 ± 2 in. from sidewall bottom or ~132.9 in. from center bottom), it is estimated that the tank BX-107 contents are equivalent to 1,305,825 L (345,000 gal). The vapor space pressure is at atmospheric. The latest temperature readings, which were taken in July 1994, show a moderate temperature value of 19°C (66°F). Two supernatant samples were collected in 1974 and 1990, prior to interim stabilization. Sludge core samples were obtained in 1979 and 1992.

1041 (WHC-EP-0743) Decision analysis for continuous cover gas monitoring of Ferrocyanide Watch List tanks. Fowler, K.D. (Westinghouse Hanford Co., Richland, WA (United States)); Graves, R.D. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016459. Source: OSTI; NTIS; INIS; GPO Dep.

This document pertains to underground waste storage tanks at the Hanford Site that have been identified to potentially contain a significant amount of ferrocyanide compounds. This document evaluates the need for continuously monitoring the headspace vapors in Ferrocyanide Watch List tanks to detect flammable gases or gases that could indicate the occurrence of a propagating ferrocyanide-nitrate/nitrite reaction. The results of modeling studies and gas monitoring, and sludge sample analyses of actual ferrocyanide tank wastes have indicated no need to continuously monitor the vapor spaces in ferrocyanide tanks. This conclusion is based in part on the following factors: (1) a study performance on waste aging suggests that the ferrocyanide has degraded in the tanks during the more than 35 years of storage; therefore, the ferrocyanide is not present in concentrations that could support an exothermic reaction, also,

the moisture present in the waste is sufficient to preclude a self-sustaining (propagating) ferrocyanide-nitrate reaction; (2) evaluation of core sample results from Tank 241-C-109 and Tank 241-C-112 support laboratory studies showing that ferrocyanide has degraded and the fuel concentration in the tanks is considerably lower than postulated by flowsheet simulants; (3) no gases have been identified that would indicate the occurrence of a ferrocyanide nitrate/nitrite reaction; additionally, a self-sustaining ferrocyanide nitrate/nitrite reaction is not possible under current and future planned storage conditions. After reviewing the available information, it is evident that there would be little safety benefit from continuous in-tank vapor monitoring, and the time and commitment of operations schedule and equipment funds are not justified in the face of competing needs.

1042 (WHC-EP-0750-Vol.1-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 1.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007478. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 1) presents the standards and requirements for the Management Systems and the Configuration Management sections.

1043 (WHC-EP-0750-Vol.2-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 2.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 293p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007479. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Document (S/RID) is contained in multiple volumes. This document (Volume 2) presents the standards and requirements for the following sections: Quality Assurance, Training and Qualification, Emergency Planning and Preparedness, and Construction.

1044 (WHC-EP-0750-Vol.3-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID).** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 209p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007480. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 3) presents the standards and requirements for the following sections: Safeguards and Security, Engineering Design, and Maintenance.

1045 (WHC-EP-0750-Vol.4-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 4.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 281p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007481. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/

RID) is contained in multiple volumes. This document (Volume 4) presents the standards and requirements for the following sections: Radiation Protection and Operations.

1046 (WHC-EP-0750-Vol.5-Rev.1-2) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 5.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007482. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 5) outlines the standards and requirements for the Fire Protection and Packaging and Transportation sections.

1047 (WHC-EP-0750-Vol.6-Rev.1) **High level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 6.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007483. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 6) outlines the standards and requirements for the sections on: Environmental Restoration and Waste Management, Research and Development and Experimental Activities, and Nuclear Safety.

1048 (WHC-EP-0750-Vol.7-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 7. Revision 1.** Burt, D.L. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 244p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007484. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 7) presents the standards and requirements for the following sections: Occupational Safety and Health, and Environmental Protection.

1049 (WHC-EP-0756) **Summary of tank waste physical properties at the Hanford Site.** Nguyen, Q.H. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013968. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the physical parameters measured from Hanford Site tank wastes. Physical parameters were measured to determine the physical nature of the tank wastes to develop simulants and design in-tank equipment. The physical parameters were measured mostly from core samples obtained directly below tank risers. Tank waste physical parameters were collected through a database search, interviewing and selecting references from documents. This report shows the data measured from tank waste but does not describe how the analyses were done. This report will be updated as additional data are measured or more documents are reviewed.

1050 (WHC-EP-0758) **Criteria for temperature monitoring in ferrocyanide waste tanks at the Hanford Site.**

Fowler, K.D.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000735. Source: OSTI; NTIS; INIS; GPO Dep.

This report is relevant to the twenty underground waste storage tanks at the Hanford Site that have been identified as potentially containing a significant amount of ferrocyanide compounds. Tanks believed to contain > 1,000 gram moles of ferrocyanide have been classified as Watch List tanks. This report addresses temperature monitoring criteria for the Ferrocyanide Watch List tanks. These criteria must comply with governing regulations to ensure that safe continued storage of the tank wastes is not jeopardized. Temperature monitoring is defined in this report as the routine as the routine continuous measurement of a waste tank temperature with an output that is tied to an actively interrogated information collection system that includes an automated warning of temperature increases beyond the established limits.

1051 (WHC-EP-0772) Characterization of the corrosion behavior of the carbon steel liner in Hanford Site single-shell tanks. Anantamula, R.P. (Westinghouse Hanford Co., Richland, WA (United States)); Schwenk, E.B.; Danielson, M.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016475. Source: OSTI; NTIS; INIS; GPO Dep.

Six safety initiatives have been identified for accelerating the resolution of waste tank safety issues and closure of unreviewed safety questions. Safety Initiative 5 is to reduce safety and environmental risk from tank leaks. Item d of Safety Initiative 5 is to complete corrosion studies of single-shell tanks to determine failure mechanisms and corrosion control options to minimize further degradation by June 1994. This report has been prepared to fulfill Safety Initiative 5, Item d. The corrosion mechanisms that apply to Hanford Site single-shell tanks are stress corrosion cracking, pitting/crevice corrosion, uniform corrosion, hydrogen embrittlement, and microbiologically influenced corrosion. The corrosion data relevant to the single-shell tanks dates back three decades, when results were obtained from in-situ corrosion coupons in a few single-shell tanks. Since that time there have been intertank transfers, evaporation, and chemical alterations of the waste. These activities have changed the character and the present composition of the waste is not well characterized. All conclusions and recommendations are made in the absence of relevant laboratory experimental data and tank inspection data. The report attempts to identify the failure mechanisms by a literature survey of carbon steel data in environments similar to the single-shell tank wastes, and by a review of the work performed at the Savannah River Site where similar wastes are stored in similar carbon steel tanks. Based on these surveys, and in the absence of data specific to Hanford single-shell tanks, it may be concluded that the single-shell tanks identified as leakers failed primarily by stress corrosion cracking due to the presence of high nitrate/low hydroxide wastes and residual stresses. In addition, some failures may be attributed to pitting under crevices in low hydroxide locations.

1052 (WHC-EP-0775) Safety issue resolution strategy plan for inactive miscellaneous underground storage tanks. Wang, O.S.; Powers, T.B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 120p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95001527. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this strategy plan is to identify, confirm, and resolve safety issues associated with inactive miscellaneous underground storage tanks (MUSTs) using a risk-based priority approach. Assumptions and processes to assess potential risks and operational concerns are documented in this report. Safety issue priorities are ranked based on a number of considerations including risk ranking and cost effectiveness. This plan specifies work scope and recommends schedules for activities related to resolving safety issues, such as collecting historical data, searching for authorization documents, performing Unreviewed Safety Question (USQ) screening and evaluation, identifying safety issues, imposing operational controls and monitoring, characterizing waste contents, mitigating and resolving safety issues, and fulfilling other remediation requirements consistent with the overall Tank Waste Remediation System strategy. Recommendations for characterization and remediation are also recommended according to the order of importance and practical programmatic consideration.

1053 (WHC-EP-0780) Vapor characterization of Tank 241-C-103. Huckaby, J.L. (Westinghouse Hanford Co., Richland, WA (United States)); Story, M.S. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016458. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company Tank Vapor Issue Resolution Program has developed, in cooperation with Northwest Instrument Systems, Inc., Oak Ridge National Laboratory, Oregon Graduate Institute of Science and Technology, Pacific Northwest Laboratory, and Sandia National Laboratory, the equipment and expertise to characterize gases and vapors in the high-level radioactive waste storage tanks at the Hanford Site in south central Washington State. This capability has been demonstrated by the characterization of the tank 241-C-103 headspace. This tank headspace is the first, and for many reasons is expected to be the most problematic, that will be characterized (Osborne 1992). Results from the most recent and comprehensive sampling event, sample job 7B, are presented for the purpose of providing scientific bases for resolution of vapor issues associated with tank 241-C-103. This report is based on the work of Clauss et al. 1994, Jenkins et al. 1994, Ligothke et al. 1994, Mahon et al. 1994, and Rasmussen and Einfeld 1994. No attempt has been made in this report to evaluate the implications of the data presented, such as the potential impact of headspace gases and vapors to tank farm workers health. That and other issues will be addressed elsewhere. Key to the resolution of worker health issues is the quantitation of compounds of toxicological concern. The Toxicology Review Panel, a panel of Pacific Northwest Laboratory experts in various areas, of toxicology, has chosen 19 previously identified compounds as being of potential toxicological concern. During sample job 7B, the sampling and analytical methodology was validated for this preliminary list of compounds of toxicological concern. Validation was performed according to guidance provided by the Tank Vapor Conference Committee, a group of analytical chemists from academic institutions and national laboratories assembled and commissioned by the Tank Vapor Issue Resolution Program.

1054 (WHC-EP-0782-Vol.1) Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary. Peters,

B.B. (Enserch Environmental Corp., Richland, WA (United States)); Cameron, R.J.; McCormack, W.D. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001846. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a System Analysis Model developed under the US Department of Energy (DOE) Office of Technology Development (OTD) Underground Storage Tank-Integrated Demonstration (UST-ID) program to aid technology development funding decisions for radioactive tank waste remediation. Current technology development selection methods evaluate new technologies in isolation from other components of an overall tank waste remediation system. These methods do not show the relative effect of new technologies on tank remediation systems as a whole. Consequently, DOE may spend its resources on technologies that promise to improve a single function but have a small or possibly negative, impact on the overall system, or DOE may overlook a technology that does not address a high priority problem in the system but that does, if implemented, offer sufficient overall improvements. Systems engineering and detailed analyses often conducted under the National Environmental Policy Act (NEPA 1969) use a "whole system" approach but are costly, too time-consuming, and often not sufficiently focused to support the needs of the technology program decision-makers. An alternative approach is required to evaluate these systems impacts but still meet the budget and schedule needs of the technology program.

1055 (WHC-EP-0782-Vol.2) Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report. Peters, B.B. (Enserch Environmental Corp., Richland, WA (United States)); Cameron, R.J.; McCormack, W.D. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 452p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001847. Source: OSTI; NTIS; INIS; GPO Dep.

Contains 2 disks.

The objective of DOE's Radioactive Waste Tank Remediation Technology Focus Area is to identify and develop new technologies that will reduce the risk and/or cost of remediating DOE underground waste storage tanks and tank contents. There are, however, many more technology investment opportunities than the current budget can support. Current technology development selection methods evaluate new technologies in isolation from other components of an overall tank waste remediation system. This report describes a System Analysis Model developed under the US Department of Energy (DOE) Office of Technology Development (OTD) Underground Storage Tank-Integrated Demonstration (UST-ID) program. The report identifies the project objectives and provides a description of the model. Development of the first "demonstration" version of this model and a trial application have been completed and the results are presented. This model will continue to evolve as it undergoes additional user review and testing.

1056 (WHC-EP-0784) Tank exhaust comparison with 40 CFR 61.93, Subpart H, and other referenced guidelines for Tank Farms National Emission Standards for Hazardous Air Pollutant (NESHAP) designated stacks. Bachand, D.D.; Crummel, G.M. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 200p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE94016470. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (EPA) promulgated National Emission Standards other than Radon from US Department of Energy (DOE) Facilities (40 CFR 61, Subpart H) on December 15, 1989. The regulations specify procedures, equipment, and test methods that are to be used to measure radionuclide emissions from exhaust stacks that are designated as National Emission Standards for Hazardous Air Pollutant (NESHAP) stacks. Designated NESHAP stacks are those that have the potential to cause any member of the public to receive an effective dose equivalent (EDE) greater than or equal to 0.1 mrem/year, assuming all emission controls were removed. Tank Farms currently has 33 exhaust stacks, 15 of which are designated NESHAP stacks. This document assesses the compliance status of the monitoring and sampling systems for the designated NESHAP stacks.

1057 (WHC-EP-0785) Raman spectroscopy peer review report. Winkelman, W.D.; Eberlein, S.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019058. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site in eastern Washington includes 177 underground storage tanks (UST), which contain waste materials produced during the production of nuclear fuels. The materials in the tanks must be characterized to support the retrieval, processing, and final disposition of the waste. Characterization is currently performed by removing waste samples for analyses in a hot cell or laboratory. A review of the Hanford Raman Spectroscopy Program was held in Richland on March 23 and 24, 1994. A team of principal investigators and researchers made presentations that covered both technical and programmatic aspects of the Hanford Site Raman work. After these presentations and discussions, the review panel met in a closed session to formalize a list of findings. The reviewers agreed that Raman spectroscopy is an excellent method to attack the tank waste characterization and screening problems that were presented. They agreed that there was a good chance that the method would be successful as presently envisioned. The reviewers provided the following primary recommendations: evaluation a laser with wavelength in the near infrared; provide optical filters at or near the sampling end of the fiber-optic probe; develop and implement a strategy for frequent calibration of the system; do not try to further increase Raman resolution at the expense of wavelength range; clearly identify and differentiate between requirements for providing a short-term operational system and requirements for optimizing a system for long-term field use; and determine the best optical configuration, which may include reduced fiber-optic diameter and/or short focal length and low F-number spectrographs.

1058 (WHC-EP-0786) Tank Waste Remediation System decisions and risk assessment. Johnson, M.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002232. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) mission is to store, treat, and immobilize the highly radioactive Hanford Site tank wastes and encapsulated cesium and strontium materials in an environmentally sound, safe, and cost effective manner. Additionally, the TWRS conducts, as part of

this mission, resolution of safety issues associated with the wastes within the 177 underground radioactive waste tanks. Systems engineering principles are being applied to determine the functions and establish requirements necessary for accomplishing the TWRS mission (DOE 1994 draft). This systematic evaluation of the TWRS program has identified key decisions that must be executed to establish mission scope, determine requirements, or select a technical solution for accomplishing identified functions and requirements. Key decisions identified through the systematic evaluation of the TWRS mission are presented in this document. Potential alternative solutions to each decision are discussed. After discussion and evaluation of each decision with effected stakeholder groups, the US Department of Energy (DOE) will select a solution from the identified alternatives for implementation. In order to proceed with the development and execution of the tank waste remediation program, the DOE has adopted a planning basis for several of these decisions, until a formal basis is established. The planning bases adopted by the DOE is continuing to be discussed with stakeholder groups to establish consensus for proceeding with proposed actions. Technical and programmatic risks associated with the planning basis adopted by the DOE are discussed.

1059 (WHC-EP-0791) Extensive separations (CLEAN) processing strategy compared to TRUEX strategy and sludge wash ion exchange. Knutson, B.J. (Westinghouse Hanford Co., Richland, WA (United States)); Jansen, G.; Zimmerman, B.D.; Seeman, S.E.; Lauerhass, L.; Hoza, M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 502p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019039. Source: OSTI; NTIS; INIS; GPO Dep.

Numerous pretreatment flowsheets have been proposed for processing the radioactive wastes in Hanford's 177 underground storage tanks. The CLEAN Option is examined along with two other flowsheet alternatives to quantify the trade-off of greater capital equipment and operating costs for aggressive separations with the reduced waste disposal costs and decreased environmental/health risks. The effect on the volume of HLW glass product and radiotoxicity of the LLW glass or grout product is predicted with current assumptions about waste characteristics and separations processes using a mass balance model. The prediction is made on three principal processing options: washing of tank wastes with removal of cesium and technetium from the supernatant, with washed solids routed directly to the glass (referred to as the Sludge Wash C processing strategy); the previous steps plus dissolution of the solids and removal of transuranic (TRU) elements, uranium, and strontium using solvent extraction processes (referred to as the Transuranic Extraction Option C (TRUEX-C) processing strategy); and an aggressive yet feasible processing strategy for separating the waste components to meet several main goals or objectives (referred to as the CLEAN Option processing strategy), such as the LLW is required to meet the US Nuclear Regulatory Commission Class A limits; concentrations of technetium, iodine, and uranium are reduced as low as reasonably achievable; and HLW will be contained within 1,000 borosilicate glass canisters that meet current Hanford Waste Vitrification Plant glass specifications.

1060 (WHC-EP-0793) Estimation of plutonium in Hanford Site waste tanks based on historical records.

Roetman, V.E.; Roblyer, S.P.; Toffer, H. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000796. Source: OSTI; NTIS; INIS; GPO Dep.

An estimation of plutonium in the Hanford Site waste storage tanks is important to nuclear criticality concerns. A reasonable approach for estimating the plutonium in the tanks can be established by considering the recovery efficiency of the chemical separation plants on the plutonium produced in the Hanford reactors. The waste loss from the separation processes represents the bulk of the plutonium in the waste tanks. The lesser contributor of plutonium to the waste tanks was the Plutonium Finishing Plant (PFP). When the PFP waste is added to the plutonium waste from separations, the result is the total estimated amount of plutonium discharged to the waste tanks at the Hanford Site. This estimate is for criticality concerns, and therefore is based on conservative assumptions (giving higher plutonium values). The estimate has been calculated to be ≈ 981 kg of plutonium in the single- and double-shell high-level waste tanks.

1061 (WHC-EP-0794) Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II. McLaren, J.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001529. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to document the results of a series of analyses conducted to determine the heat loads of the second of two groups of tanks on the Ferrocyanide Watch List. The analyses of the second group of tanks used the fill/transfer history and tank temperature data with a transient solution for the heat load determination. Nominal heat load values were determined, as well as the upper and lower bounds of the heat load. Because the waste level in most of these tanks was low, thermal conductivity estimation could only be made for two tanks. The method used in this report uses computer analysis of the tank and its contents, along with the temperature data obtained from in situ thermocouple trees, to determine the heat load of the tanks and the thermal conductivity of the waste. A computer model of the tank and its contents is used that also includes the surrounding soil, which is the main heat sink.

1062 (WHC-EP-0796) Ferrocyanide Safety Program: Data interpretation report for tank 241-T-107 core samples. Sasaki, L.M.; Valenzuela, B.D. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000459. Source: OSTI; NTIS; INIS; GPO Dep.

Between November 1992 and March 1993, three core samples were obtained from tank 241-T-107. Analyses were performed on these core samples to support the Ferrocyanide Safety Program and the Hanford Federal Facility Agreement and Consent Order (Ecology et al. 1994) Milestone M-10-00. This document summarizes and evaluates those analytical results that are pertinent to the Ferrocyanide Safety Issue. This document compares the analytical results with the data requirements for ferrocyanide tanks as documented in Data Requirements of the Ferrocyanide Safety Issue Developed Through the Data Quality Objectives Process (Meacham et al. 1994) and provides an assessment of the safety condition of the tank. Analytes not listed in the Data Quality Objectives (DQO) document

(Meacham et al. 1994) or not pertinent to the Ferrocyanide Safety Issue are not discussed in this report. Complete documentation of the analytical results can be found in the data package for the tank 241-T-107 cores (Svancara and Pool 1993). A more complete evaluation of the analytical results and an estimate of the tank inventory will be provided in a forthcoming tank characterization report for tank 241-T-107.

1063 (WHC-EP-0800) Ferrocyanide safety program: Moisture migration test in ferrocyanide simulant. Crippen, M.D. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000734. Source: OSTI; NTIS; INIS; GPO Dep.

During the initial phases of the Ferrocyanide Safety Program, it was presumed that actual sludge in tanks would behave as if it were a two-phase system in which a brine phase would seep through the insoluble solid phase of ferrocyanide and other precipitated salts. After flowsheet materials were produced and extensively tested, it became apparent that the ferrocyanide precipitates held extensive quantities of water (50% by weight or more) that were far above what would be expected from hydrated salts. Because little or no draining of this fluid occurred over a period of months, it was concluded that the precipitates and their solution would act as a homogeneous single phase in much the same way as natural clays. Suggestions were made that the testing of clays could add to existing knowledge of sludge hydraulic and rheologic properties, at a much-reduced cost in chemicals and time over that required for flowsheet materials. Tests were conducted in a 400-L volume of ferrocyanide sludge simulant to determine thermal characteristics around heated zones. At low heat loads, surface vapor losses were much lower than return rates, resulting in no net change in water content. Under boiling conditions, no bulk dryout occurred. These results were consistent with the results from earlier small-scale experiments.

1064 (WHC-EP-0805) Enhanced sludge washing evaluation plan. Jensen, R.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001843. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Program mission is to store, treat, and immobilize highly radioactive Hanford Site waste (current and future tank waste and the strontium/cesium capsules) in an environmentally sound, safe, and cost-effective manner. The scope of the TWRS Waste Pretreatment Program is to treat tank waste and separate that waste into HLW and LLW fractions and provide additional treatment as required to feed LLW and HLW immobilization facilities. Enhanced sludge washing was chosen as the baseline process for separating Hanford tank waste sludge. Section 1.0 briefly discusses the purpose of the evaluation plan and provides the background that led to the choice of enhanced sludge washing as the baseline process. Section 2.0 provides a brief summary of the evaluation plan details. Section 3.0 discusses, in some detail, the technical work planned to support the evaluation of enhanced sludge washing. Section 4.0 briefly discusses the potential importance of policy issues to the evaluation. Section 5.0 discusses the methodology to be used in the evaluation process. Section 6.0 summarizes the milestones that have been defined to complete the enhanced sludge washing evaluation and provides a summary schedule to evaluate the performance of enhanced sludge washing. References

are identified in Section 7.0, and additional schedule and milestone information is provided in the appendices.

1065 (WHC-EP-0806) Tank 241-T-111 characterization report. Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 421p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003215. Source: OSTI; NTIS; INIS; GPO Dep.

In late October and early November of 1991, single-shell tank (SST) 241-T-111 (on the Organic Watch List) was sampled and analyses were conducted on the materials obtained to complete Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-10-00 to sample and analyze two cores from each tank. Other objectives that these measurements and inventory estimates support are as follows: Obtain estimates of both the concentration and total quantity of key analytes relating to safety issues, such as organics and radionuclides; Provided input to risk assessment-based disposal decisions for the waste; and Implement physical property measurements, such as rheology, bulk density, and particle size. These measurements are necessary for the design and fabrication of retrieval, pretreatment, and vitrification systems. The purpose of the tank characterization report is to describe and characterize the waste in SST 241-T-111, based on information from various sources. This report summarizes the available information regarding the waste in tank 241-T-111, and arranges this information in a format useful to support management and technical decisions concerning this waste tank.

1066 (WHC-EP-0807) Development and testing of single-shell tank waste retrieval technologies: Milestone M-45-01 summary report. Shen, E.J. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005470. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the activities undertaken to develop single-shell tank (SST) waste retrieval technology and complete scale-model testing. Completion of these activities fulfills the commitment of Milestone M-45-01 of the Hanford Federal Facility Agreement and Consent Order (the Tri-Party Agreement). Initial activities included engineering studies that compiled and evaluated data on all known retrieval technologies. Based on selection criteria incorporating regulatory, safety, and operational issues, several technologies were selected for further evaluation and testing. The testing ranged from small-scale, bench-top evaluations of individual technologies to full-scale integrated tests of multiple subsystems operating concurrently as a system using simulated wastes. The current baseline retrieval method for SSTs is hydraulic sluicing. This method has been used successfully in the past to recover waste from SSTs. Variations of this hydraulic or "past practice" sluicing may be used to retrieve the waste from the majority of the SSTs. To minimize the potential for releases to the soil, arm-based retrieval systems may be used to recover waste from tanks that are known or suspected to have leaked. Both hydraulic sluicing and arm-based retrieval will be demonstrated in the first SST. Hydraulic sluicing is expected to retrieve most of the waste, and arm-based retrieval will retrieve wastes that remain after sluicing. Subsequent tanks will be retrieved by either hydraulic sluicing or arm-based methods, but not both. The method will be determined by waste characterization, tank integrity (leak status), and presence of in-tank hardware.

Currently, it is assumed that approximately 75% of all SSTs will be retrieved by hydraulic sluicing and the remaining tanks by arm-based methods.

1067 (WHC-EP-0809) Potential tank waste material anomalies located near the liquid observation wells: Model predicted responses of a neutron moisture detection system. Finrock, S.H.; Toffer, H.; Watson, W.T. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002106. Source: OSTI; NTIS; INIS; GPO Dep.

Extensive analyses have been completed to demonstrate that a neutron moisture probe can be used to recognize anomalies in materials and geometry surrounding the liquid observation wells (LOWs). Furthermore, techniques can be developed that will permit the interpretation of detector readings, perturbed by the presence of anomalies, as more accurate moisture concentrations. This analysis effort extends the usefulness of a neutron moisture probe system significantly, especially in the complicated geometries and material conditions that may be encountered in the waste tanks. Both static-source and pulsed-source neutron probes were considered in the analyses. Four different detector configurations were investigated: Thermal and epithermal neutron detectors located in both the near and far field.

1068 (WHC-EP-0816) Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout. Epstein, M. (Fauske and Associates, Inc., Burr Ridge, IL (United States)); Fauske, H.K.; Dickinson, D.R.; Crippen, M.D.; McCormack, J.D.; Cash, R.J.; Meacham, J.E.; Simmons, C.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001578. Source: OSTI; NTIS; INIS; GPO Dep.

Much attention has been focused on the Hanford Site radioactive waste storage tanks as a result of problems that have been envisioned for them. One problem is the potential chemical reaction between ferrocyanide precipitate particles and nitrates in the absence of water. This report addresses the question of whether dryout of a portion of ferrocyanide sludge would render it potentially reactive. Various sludge dryout mechanisms were examined to determine if any of them could occur. The mechanisms are: (1) bulk heating of the entire sludge inventory to its boiling point; (2) loss of liquid to the atmosphere via sludge surface evaporation; (3) local drying by boiling in a hot spot region; (4) sludge drainage through a leak in the tank wall; and (5) local drying by evaporation from a warm segment of surface sludge. From the simple analyses presented in this report and more detailed published analyses, it is evident that global loss of water from bulk heating of the sludge to its boiling point or from surface evaporation and vapor transport to the outside air is not credible. Also, from the analyses presented in this report and experimental and analytical work presented elsewhere, it is evident that formation of a dry local or global region of sludge as a result of tank leakage (draining of interstitial liquid) is not possible. Finally, and most importantly, it is concluded that formation of dry local regions in the ferrocyanide sludge by local hot spots or warm surface regions is not possible. The conclusion that local or global dryout is incredible is consistent with four decades of waste storage history, during which sludge temperature have gradually decreased or remained constant and the sludge moisture content has been retained. 54 refs.

1069 (WHC-EP-0831) Preliminary analysis of tank 241-C-106 dryout due to large postulated leak and vaporization. Piepho, M.G. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005600. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis assumes that there is a hypothetical large leak at the bottom of Tank 241-C-106 which initiates the dryout of the tank. The time required for a tank to dryout after a leak is of interest for safety reasons. As a tank dries out, its temperature is expected to increase which could affect the structural integrity of the concrete tank dome. Hence, it is of interest to know how fast and how high the temperature in a leaky tank increases, so that mitigation procedures can be planned and implemented in a timely manner. This analysis is focused on tank 241-C-106, which is known to be high thermal tank. The objective of the study was to determine how long it would take for tank 241-C-106 to reach 350 degrees Fahrenheit (about 177 degrees Centigrade) after a postulated large leak develops at the bottom center of the tank. The temperature of 350 degrees Fahrenheit is the minimum temperature that can cause structural damage to concrete (ACI 1992). The postulated leak at the bottom of the tank and the resulting dryout of the sludge in the tank make this analysis different from previous thermal analyses of the C-106 tank and other tanks, especially the double-shell tanks which are mostly liquid.

1070 (WHC-EP-0839) Summary of fiscal year 1994 near-infrared spectroscopy moisture sensing activities. Reich, F.R.; Johnson, R.E.; Philipp, B.L.; Duncan, J.B.; Schutzenhofer, G.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005477. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the work to develop and deploy near-infrared (NIR) moisture sensing technology for application to the Hanford Site's high-level nuclear waste materials. This work is jointly supported by the U.S. Department of Energy's (DOE) EM-50 Office of Technology Development Support and the EM-30 Tank Waste Safety and Tank Waste Remediation Systems Programs. A basic NIR system was developed at the Savannah River Laboratory (SRL) with support from DOE's EM-50 Office. The application of this technology to Hanford's high-level wastes (HLW). Including deployment, is supported by DOE's EM-30 Systems Programs. The need to know the moisture content in HLW is driven by concerns for the safety of underground storage tanks that contain or are suspected of containing ferrocyanide and organic types of materials. The NIR technology has application for both ex situ (hot cell core measurements) and in situ waste tank moisture sensing. The cold test/calibration data in this report was generated as part of the total life cycle development path being followed in the development and deployment of the NIR technology at the Hanford Site.

1071 (WHC-EP-0847) High-level waste melter alternatives assessment report. Calmus, R.B. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007772. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Tank Waste Remediation System (TWRS) High-Level Waste (HLW) Program's (hereafter referred to as HLW Program) Melter Candidate Assessment Activity performed in fiscal year (FY) 1994. The mission of the TWRS Program is to store, treat, and immobilize highly radioactive Hanford Site waste (current and future tank waste and encapsulated strontium and cesium isotopic sources) in an environmentally sound, safe, and cost-effective manner. The goal of the HLW Program is to immobilize the HLW fraction of pretreated tank waste into a vitrified product suitable for interim onsite storage and eventual offsite disposal at a geologic repository. Preparation of the encapsulated strontium and cesium isotopic sources for final disposal is also included in the HLW Program. As a result of trade studies performed in 1992 and 1993, processes planned for pretreatment of tank wastes were modified substantially because of increasing estimates of the quantity of high-level and transuranic tank waste remaining after pretreatment. This resulted in substantial increases in needed vitrification plant capacity compared to the capacity of original Hanford Waste Vitrification Plant (HWVP). The required capacity has not been finalized, but is expected to be four to eight times that of the HWVP design. The increased capacity requirements for the HLW vitrification plant's melter prompted the assessment of candidate high-capacity HLW melter technologies to determine the most viable candidates and the required development and testing (D and T) focus required to select the Hanford Site HLW vitrification plant melter system. An assessment process was developed in early 1994. This document describes the assessment team, roles of team members, the phased assessment process and results, resulting recommendations, and the implementation strategy.

1072 (WHC-MR-0455) Testing of organic waste surrogate materials in support of the Hanford organic tank program: Final report. Turner, D.A. (Westinghouse Hanford Co., Richland, WA (United States)); Miron, Y. (Westinghouse Hanford Co., Richland, WA (United States)). Jan 1994. 175p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94011399. Source: OSTI; NTIS; INIS; GPO Dep.

To address safety issues regarding effective waste management efforts of underground organic waste storage tanks at the Hanford Site, the Bureau of Mines conducted a series of tests, at the request of the Westinghouse Hanford company. In this battery of tests, the thermal and explosive characteristics of surrogate materials, chosen by Hanford, were determined. The surrogate materials were mixtures of inorganic and organic sodium salts, representing fuels and oxidants. The oxidants were sodium nitrate and sodium nitrite. The fuels were sodium salts of oxalate, citrate and ethylenediamine tetraacetic acid (EDTA). Polyethylene powder was also used as a fuel with the oxidant(s). Sodium aluminate was used as a diluent. In addition, a sample of FeCN, supplied by Hanford was also investigated.

1073 (WHC-MR-0483) TBP and diluent mass balances in the PUREX Plant at Hanford, 1955-1991. Sederburg, J.P. (Westinghouse Hanford Co., Richland, WA (United States)); Reddick, J.A. (Westinghouse Hanford Co., Richland, WA (United States)). Dec 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004980. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to develop an estimate of the quantities of tributyl phosphate and diluent discharged in

aqueous waste streams to the tank farms from the Hanford Purex Plant over its operating life. Purex was not the sole source of organics in the tank farms, but was a major contributor. Tributyl phosphate (TBP) and diluent, which changed from Shell E-2342® to Soltrol-170® and then to normal paraffin hydrocarbon (NPH), were organic chemicals used in the Purex solvent extraction process at Hanford to separate plutonium and uranium from spent nuclear fuels. This report is an estimate of the material balances for these chemicals in the Purex Plant at Hanford over its entire operating life. The Purex Plant had cold start up in November 1955 and shut down in 1990. Its process used a solution of 30 vol% TBP in diluent.

1074 (WHC-MR-0492) Glass Science tutorial lecture No. 5: Historical review of USDOE tank waste management. McDaniel, E.W. (Westinghouse Hanford Co., Richland, WA (United States)). Feb 1995. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008460. Source: OSTI; NTIS; INIS; GPO Dep.

This is a two day course whose objective is to present an unbiased historical overview of the DOE tank waste activities. World events which impacted the US nuclear program (or vice versa) will be presented. Liquid, mostly tank waste, and sludge are the primary concerns of this course.

1075 (WHC-SA-1196-Rev.1) Application of a CdTe gamma-ray spectrometer to remote characterization of high-level radioactive waste tanks. Addleman, R.S.; Blewett, G.R.; Keele, B.D.; McClellan, C.S.; Subrahmanyam, V.B.; Troyer, G.L. (Westinghouse Hanford Co., Richland, WA (United States)). Apr 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007560. Source: OSTI; NTIS; INIS; GPO Dep.

Small, shielded cadmium telluride (CdTe) semiconductor gamma-ray detectors have been used for in situ radiological characterization of underground high-level radioactive waste tanks. Remote measurements have been made in gamma radiation fields up to 700 R/h. Spectral data have been used to generate qualitative and quantitative radionuclide profiles of high-level radioactive waste tanks. Two electronic spectral enhancement techniques (pulse risetime discrimination and pulse risetime compensation) have been used in order to measure trace isotopes with photopeak energies greater than 662keV in the presence of large amounts of ¹³⁷Cs. Spectral resolution of 1.5% for the ¹³⁷Cs 662 keV photopeak has been obtained.

1076 (WHC-SA-1601) Description of the grout system dynamic simulation. Zimmerman, B.D. (Westinghouse Hanford Co., Richland, WA (United States)). Jul 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-921102-64: Joint American Nuclear Society/European Nuclear Society (ANS/ENS) international meeting on fifty years of controlled nuclear chain reaction: past, present, and future, Chicago, IL (United States), 15-20 Nov 1992). Order Number DE95004104. Source: OSTI; NTIS; INIS; GPO Dep.

The grout system dynamic computer simulation was created to allow investigation of the ability of the grouting system to meet established milestones, for various assumed system configurations and parameters. The simulation simulates the movement of tank waste through the system versus time, from initial storage tanks, through feed tanks

and the grout plant, then finally to a grout vault. The simulation properly accounts for the following (1) time required to perform various actions or processes, (2) delays involved in gaining regulatory approval, (3) random system component failures, (4) limitations on equipment capacities, (5) available parallel components, and (6) different possible strategies for vault filling. The user is allowed to set a variety of system parameters for each simulation run. Currently, the output of a run primarily consists of a plot of projected grouting campaigns completed versus time, for comparison with milestones. Other outputs involving any model component can also be quickly created or deleted as desired. In particular, sensitivity runs where the effect of varying a model parameter (flow rates, delay times, number of feed tanks available, etc.) on the ability of the system to meet milestones can be made easily. The grout system simulation was implemented using the ITHINK* simulation language for Macintosh** computers.

1077 (WHC-SA-1884) Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances. Conrads, T.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310102-48: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE95001641. Source: OSTI; NTIS; INIS; GPO Dep.

In the fall of 1992, a draft of the Seismic Design and Evaluation Guidelines for the Department of Energy (DOE) High-level Waste Storage Tanks and Appurtenances was issued. The guidelines were prepared by the Tanks Seismic Experts Panel (TSEP) and this task was sponsored by DOE, Environmental Management. The TSEP is comprised of a number of consultants known for their knowledge of seismic ground motion and expertise in the analysis of structures, systems and components subjected to seismic loads. The development of these guidelines was managed by staff from Brookhaven National Laboratory, Engineering Research and Applications Division, Department of Nuclear Energy. This paper describes the process used to incorporate the Seismic Design and Evaluation Guidelines for the DOE High-Level Waste Storage Tanks and Appurtenances into the design criteria for the Multi-Function Waste Tank Project at the Hanford Site. This project will design and construct six new high-level waste tanks in the 200 Areas at the Hanford Site. This paper also discusses the vehicles used to ensure compliance to these guidelines throughout Title 1 and Title 2 design phases of the project as well as the strategy used to ensure consistent and cost-effective application of the guidelines by the structural analysts. The paper includes lessons learned and provides recommendations for other tank design projects which might employ the TSEP guidelines.

1078 (WHC-SA-2016) Structural design and analysis of the multi-function waste tanks. Farnworth, S.K. (Westinghouse Hanford Co., Richland, WA (United States)); Stine, M.D.; Miller, L.K. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310102-46: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94015755. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes structural design and analysis procedures to be used for the Multi-function Waste Tank Facility

underground waste storage tanks proposed for the Hanford Site. The Multi-function Waste Tank Facility will consist of four one-million-gallon nominal capacity, double-shell, underground waste storage tanks and will include the associated process and control systems and aboveground structures. The tanks will consist of an inner primary steel tank and an outer secondary reinforced-concrete steel-lined tank. The primary tank head will be structurally attached to the concrete dome. A supporting layer of material will be placed between the bottom of the primary steel tank and the bottom of the steel liner on the secondary tank. The tank analysis is undertaken jointly by a team of engineers and analysts representing Kaiser Engineers Hanford, the site architect/engineer, and Westinghouse Hanford Company, the site management and operating contractor. This analysis is planned in several phases. Heat transfer solutions will address the anticipated mixing pump and cyclic fill/drain environment to provide steel and concrete temperature distributions. With this information, an in situ static analysis of the reinforced-concrete secondary tank will be carried out over the structure design life and will give material states and deformations along with strength and stability checks. Seismic analysis, accounting for soil-structure interaction and liquid loads, will be conducted with the most conservative material state, and the in situ deformations will be incorporated. Finally, penetrations and other components will be analyzed.

1079 (WHC-SA-2305) Mitigation of the most hazardous tank at the Hanford Site. Reynolds, D.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9409215-2: 6. Emerging technologies in hazardous waste management, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95000525. Source: OSTI; NTIS; INIS; GPO Dep.

Various tanks at the Hanford Site have been declared to be unresolved safety problems. This means that the tank has the potential to be beyond the limits covered by the current safety documentation. Tank 241-SY-101 poses the greatest hazard. The waste stored in this tank has periodically released hydrogen gas which exceeds the lower flammable limits. A mixer pump was installed in this tank to stir the waste. Stirring the waste would allow the hydrogen to be released slowly in a controlled manner and mitigate the hazard associated with this tank. The testing of this mixer pump is reported in this document. The mixer pump has been successful in controlling the hydrogen concentration in the tank dome to below the flammable limit which has mitigated the hazardous gas releases.

1080 (WHC-SA-2335) The Hanford site tank waste remediation system technical strategy. Wodrich, D.D. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-56: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94014629. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's Hanford Site, located in southeastern Washington State, has the most diverse and largest amount of radioactive tank the United States. High-level radioactive waste has been stored in large underground tanks since 1944. Approximately 230,000 m³ (61 Mgal) of caustic liquids, slurries, saltcakes, and sludges have accumulated in 177 tanks. In addition, significant

amounts of ^{90}S and ^{137}Cs were removed from the tank waste, converted to salts, doubly encapsulated in metal containers, and stored in water basins. A Tank Waste Remediation System Program was established by the US DOE Energy in 1991 to safely manage and immobilize these wastes for permanent disposal of the high-level waste fraction in a geologic repository. The technical strategy to manage and dispose of these wastes has been revised and successfully negotiated with the regulatory agencies.

1081 (WHC-SA-2347) Integral TRU measurements in Hanford waste tanks using gas analysis. Wittekind, W.D. (Westinghouse Hanford Co., Richland, WA (United States)); Toffer, H.; Koglin, J.E. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-9: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013008. Source: OSTI; NTIS; INIS; GPO Dep.

It is possible to assess the TRU content of a Hanford waste tank using an integral gas measurement in the tank head space. An integral transuranic (TRU) measurement is an assessment of the entire system such as a tank for TRU content. Waste tanks up to 75 feet diameter and 1,000,000 gallon capacity can be measured, however a number of specific challenges need to be overcome. Integral TRU measurements involve gas analysis for noble gases. Helium (decay product), krypton and xenon (fission products) and radon (daughter product) are noble gases. Noble gases would be expected to diffuse through most waste forms and, after achieving saturation, diffuse out of the waste form. Noble gases would, depending on air exchange rates, achieve equilibrium in the air space above the waste form. Helium measurements were performed on air from the head space in two Hanford waste tanks. Analytical results from one tank showed a statistically significant elevation above natural background helium implying source TRU presence.

1082 (WHC-SA-2407) Global modeling of Hanford tank waste pretreatment alternatives within a total cleanup system using ASPEN PLUS™. Knutson, B.J. (Westinghouse Hanford Co., Richland, WA (United States)); Jansen, G. Jr.; Zimmerman, B.D.; Niccoli, L.G.; Lauerhass, L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9411135-3: ASPENWORLD 94, Boston, MA (United States), 6-9 Nov 1994). Order Number DE95004488. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this work is to evaluate and compare radionuclide separations/processing technologies being developed or considered as Hanford tank waste pretreatment alternatives. These technologies are integrated into a total cleanup system that includes tank waste retrieval, treatment, and disposal. Current Hanford flowsheets typically include only mature, developed technologies, not new technologies. Thus, this work examines the impact/benefits of inserting new technologies into Hanford flowsheets. Waste treatment must produce disposal fractions which are less troublesome than the original material. Researchers seeking effective treatment methods may lack the tools or expertise to fully understand the implications of their approach in terms of secondary and tertiary waste streams or the extent to which a unique new process will affect upstream or downstream processes. This work has developed and demonstrated

mass balance methods that clarify the effect of including individual processes in an integrated waste treatment system, such as the Hanford cleanup system. The methods provide a measure of treatment effectiveness and a format for the researcher to understand waste stream interrelationships and determine how a particular treatment technology can best be used in a cleanup system. A description of the Hanford tank waste cleanup model developed using the ASPEN PLUS flowsheet simulation tool is given. Important aspects of the modeling approach are discussed along with a description of how performance measures were developed and integrated within the simulation to evaluate and compare various Hanford tank waste pretreatment alternatives.

1083 (WHC-SA-2447) Identification of single-shell tank in-tank hardware obstructions to retrieval at Hanford Site Tank Farms. Ballou, R.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232-11: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95003044. Source: OSTI; NTIS; INIS; GPO Dep.

Two retrieval technologies, one of which uses robot-deployed end effectors, will be demonstrated on the first single-shell tank (SST) waste to be retrieved at the Hanford Site. A significant impediment to the success of this technology in completing the Hanford retrieval mission is the presence of unique tank contents called in-tank hardware (ITH). In-tank hardware includes installed and discarded equipment and various other materials introduced into the tank. This paper identifies those items of ITH that will most influence retrieval operations in the arm-based demonstration project and in follow-on tank operations within the SST farms.

1084 (WHC-SA-2449) Retrieval of underground storage tank wastes: The Hanford challenge. Shen, E.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232-13: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95003046. Source: OSTI; NTIS; GPO Dep.

Approximately 140,000 m³ (37 Mgal) of waste material now resides in 149 SSTs single-shell tanks. These tanks are of an early design that consists of a carbon-steel liner surrounded by a reinforced structural concrete shell. Originally designed for a 20-year life, the first of those constructed are surpassing that expectation. Many have lost confinement integrity, and leaks to the environment have been detected. These wastes present a significant recovery challenge. The goal is to develop and field retrieval systems with the capability to remove wastes from these tanks and transfer those wastes for further downstream processing. The application of existing technologies has been the foundation of the retrieval strategy. However the aggressive schedules and complexity of the wastes to be recovered have required the search for and the development of more advanced technologies. This paper discusses the long-term strategy that has been developed to support the waste retrieval efforts of the Tank Waste Remediation System program.

1085 (WHC-SA-2478) Status of test results of electrochemical organic oxidation of a tank 241-SY-101 simulated waste. Colby, S.A. Westinghouse Hanford Co.,

Richland, WA (United States). Jun 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940853-3: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94015710. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents scoping test results of an electrochemical waste pretreatment process to oxidize organic compounds contained in the Hanford Site's radioactive waste storage tanks. Electrochemical oxidation was tested on laboratory scale to destroy organics that are thought to pose safety concerns, using a nonradioactive, simulated tank waste. Minimal development work has been applied to alkaline electrochemical organic destruction. Most electrochemical work has been directed towards acidic electrolysis, as in the metal purification industry, and silver catalyzed oxidation. Alkaline electrochemistry has traditionally been associated with the following: (1) inefficient power use, (2) electrode fouling, and (3) solids handling problems. Tests using a laboratory scale electrochemical cell oxidized surrogate organics by applying a DC electrical current to the simulated tank waste via anode and cathode electrodes. The analytical data suggest that alkaline electrolysis oxidizes the organics into inorganic carbonate and smaller carbon chain refractory organics. Electrolysis treats the waste without adding chemical reagents and at ambient conditions of temperature and pressure. Cell performance was not affected by varying operating conditions and supplemental electrolyte additions.

1086 (WHC-SA-2504) Calculation of radiation fields for Hanford tank riser modifications. Schwarz, R.A.; Carter, L.L.; Hillesland, K.E. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941148-2: ANS meeting on environmental aspects of decommissioning, decontamination, and/or environmental restoration at nuclear and mixed waste facilities, Washington, DC (United States), 13-17 Nov 1994). Order Number DE95002476. Source: OSTI; NTIS; INIS; GPO Dep.

A visualization process has been created to animate the dose rates from radiation sources as the source and shielding configuration are modified. This process has been illustrated with the removal of a mixer pump from a Hanford Site waste tank.

1087 (WHC-SA-2539) Recommendations for erosion-corrosion allowance for Multi-Function Waste Tank Facility tanks. Carlos, W.C. (Westinghouse Hanford Co., Richland, WA (United States)); Brehm, W.F.; Larrick, A.P.; Divine, J.R. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304-3: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95002966. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility carbon steel tanks will contain mixer pumps that circulate the waste. On the basis of flow characteristics of the system and data from the literature, an erosion allowance of 0.075 mm/y (3 mil/year) was recommended for the tank bottoms, in addition to the 0.025 mm/y (1 mil/year) general corrosion allowance.

1088 (WHC-SA-2540) Material selection for Multi-Function Waste Tank Facility tanks. Larrick, A.P. (Westinghouse Hanford Co., Richland, WA (United States)); Blackburn, L.D.; Brehm, W.F.; Carlos, W.C.; Hauptmann, J.P.; Danielson, M.J.; Westerman, R.E.; Divine, J.R.; Foster, G.M. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304-10: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005139. Source: OSTI; NTIS; GPO Dep.

This paper briefly summarizes the history of the materials selection for the US Department of Energy's high-level waste carbon steel storage tanks. It also provides an evaluation of the materials for the construction of new tanks at the evaluation of the materials for the construction of new tanks at the Multi-Function Waste Tank Facility. The evaluation included a materials matrix that summarized the critical design, fabrication, construction, and corrosion resistance requirements: assessed, each requirement: and cataloged the advantages and disadvantages of each material. This evaluation is based on the mission of the Multi-Function Waste Tank Facility. On the basis of the compositions of the wastes stored in Hanford waste tanks, it is recommended that tanks for the Multi-Function Waste Tank Facility be constructed of ASME SA 515, Grade 70, carbon steel.

1089 (WHC-SA-2544) Hanford double shell tank corrosion monitoring instrument trees. Nelson, J.L. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304-11: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005161. Source: OSTI; NTIS; INIS; GPO Dep.

High-level nuclear wastes at the Hanford site are stored underground in carbon steel double-shell and single-shell tanks - (DSTs and SSTs). Westinghouse Hanford Company is considering installation of a prototype corrosion monitoring instrument tree in at least one DST in the summer of 1995. The instrument tree will have the ability to detect and discriminate between uniform corrosion, stress corrosion cracking (SCC), and pitting. Additional instrument trees will follow in later years. Proof-of-technology testing is currently underway for the use of commercially available electric field pattern (EFP) analysis and electrochemical noise (EN) corrosion monitoring equipment. Creative use and combinations of other existing technologies is also being considered. Successful demonstration of these technologies will be followed by the development of a Hanford specific instrument tree. The first instrument tree will incorporate one of these technologies. Subsequent trees may include both technologies, as well as a more standard assembly of corrosion coupons. Successful development of these trees will allow their application to single shell tanks and the transfer of technology to other U.S. Department of Energy (DOE) sites.

1090 (WHC-SA-2549) Independent assessment to continue improvement: Implementing statistical process control at the Hanford Site. Hu, T.A.; Lo, J.C. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 11p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. (CONF-950269-1: 4. annual quality audit conference, Baltimore, MD (United States), 23-24 Feb 1995). Order Number DE95005160. Source: OSTI; NTIS; INIS; GPO Dep.

A Quality Assurance independent assessment has brought about continued improvement in the PUREX Plant surveillance program at the Department of Energy's Hanford Site. After the independent assessment, Quality Assurance personnel were closely involved in improving the surveillance program, specifically regarding storage tank monitoring. The independent assessment activities included reviewing procedures, analyzing surveillance data, conducting personnel interviews, and communicating with management. Process improvement efforts included: (1) designing data collection methods; (2) gaining concurrence between engineering and management; (3) revising procedures; and (4) interfacing with shift surveillance crews. Through this process, Statistical Process Control (SPC) was successfully implemented and surveillance management was improved. The independent assessment identified several deficiencies within the surveillance system. These deficiencies can be grouped into two areas: (1) data recording and analysis and (2) handling off-normal conditions. By using several independent assessment techniques, Quality Assurance was able to point out program weakness to senior management and present suggestions for improvements. SPC charting, as implemented by Quality Assurance, is an excellent tool for diagnosing the process, improving communication between the team members, and providing a scientific database for management decisions. In addition, the surveillance procedure was substantially revised. The goals of this revision were to (1) strengthen the role of surveillance management, engineering and operators and (2) emphasize the importance of teamwork for each individual who performs a task. In this instance we believe that the value independent assessment adds to the system is the continuous improvement activities that follow the independent assessment. Excellence in teamwork between the independent assessment organization and the auditee is the key to continuing improvement.

1091 (WHC-SA-2562) Waste tank sample transport. Field, J.G.; Mercado, M.S.; Smith, R.J.; Thornton, J.W. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9408124-8: Transportation management annual workshop, Rockville, MD (United States), 8-11 Aug 1994). Order Number DE94018157. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1943, radioactive liquid waste has been stored in underground storage tanks at the Hanford Site in Richland, Washington. The waste was the result of chemical separation processes for the production of fissile defense materials. Associated with the current environmental cleanup mission, waste characterization and processing programs are requiring the extraction of samples from the tanks. Approved onsite packaging are in place and in use for transfers of samples from the tanks to onsite laboratories. Initiatives are under way to develop and procure packaging for sample shipments to offsite laboratories. This paper will provide a current status of the tank sample packaging used at the Hanford Site, as well as the project status for new packaging to be used for offsite shipments.

1092 (WHC-SA-2563) Generation and release of flammable gases in Hanford tanks: An overview. Johnson, G.D.; McDuffie, N.G. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 13p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940813-26: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95000997. Source: OSTI; NTIS; INIS; GPO Dep.

Twenty-five of the 177 high-level waste tanks at the Hanford Site have been identified as having the potential to generate and release flammable gases. This issue was declared an unreviewed safety question (USQ) in early 1990. Designation of the USQ in accordance with the United States Department of Energy (DOE) orders initiated a series of actions that will culminate in an updated safety analysis report (SAR) and new operating restrictions. At the time the USQ was declared, interim operational safety requirements were established to restrict activities in the dome spaces, ventilation systems, peripheral equipment, and operations associated with the waste in these tanks. Most important, steps were taken to eliminate potential ignition sources; these included shutting down certain equipment, using electrical bonding and grounding techniques, and using non-sparking tools.

1093 (WHC-SA-2565) The solubilities of significant organic compounds in HLW tank supernate solutions. Barney, G.S. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940813-32: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95004163. Source: OSTI; NTIS; INIS; GPO Dep.

Large quantities of organic chemicals used in reprocessing spent nuclear-fuels at the Hanford Site have accumulated in underground high-level radioactive waste tanks. The organic content of these tanks must be known so that the potential for hazardous reactions between organic components and sodium nitrate/nitrite salts in the waste can be evaluated. The solubilities of organic compounds described in this report will help determine if they are present in the solid phases (salt cake and sludges) as well as the liquid phase (interstitial liquor/supernate) in the tanks. The solubilities of five significant sodium salts of carboxylic acids and aminocarboxylic acids [sodium oxalate, formate, citrate, nitrilotriacetate (NTA) and ethylenediaminetetraacetate (EDTA)] were measured in a simulated supernate solution at 25°C, 30°C, 40°C, and 50°C.

1094 (WHC-SA-2584) Hanford site waste tank characterization. De Lorenzo, D.S.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940813-28: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95000517. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the on-going work in the characterization of the Hanford-Site high-level waste tanks. The waste in these tanks was produced as part of the nuclear weapons materials processing mission that occupied the Hanford Site for the first 40 years of its existence. Detailed and defensible characterization of the tank wastes is required to guide retrieval, pretreatment, and disposal technology development, to address waste stability and reactivity concerns, and to satisfy the compliance criteria for the various regulatory agencies overseeing activities at the Hanford Site. The resulting Tank Characterization Reports fulfill these needs, as

well as satisfy the tank waste characterization milestones in the Hanford Federal Facility Agreement and Consent Order.

1095 (WHC-SA-2595) Performance and risk assessment of subsurface barriers for single-shell tank waste retrieval. Bazinet, G.D. (Westinghouse Hanford Co., Richland, WA (United States)); Cruse, J.M.; Hampsten, K.L.; Treat, R.L. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007186. Source: OSTI; NTIS; INIS; GPO Dep.

Subsurface barriers are among various alternatives under evaluation to mitigate the threat of leakage from the Hanford Site's 149 single-shell high-level radioactive waste tanks. The Tank Waste Remediation System (TWRS) division of Westinghouse Hanford Company is conducting this evaluation of subsurface barriers and other alternatives, focusing on risk and cost as performance measures. A number of alternative retrieval/closure approaches were evaluated in terms of risks (carcinogenic and toxicological) to a postulated maximally exposed individual. In addition, worker and accident risks were evaluated and factors developed for each alternative on a relative basis. The work performed to date indicates the use of subsurface barriers may potentially reduce public risk by limiting contamination of groundwater below the Hanford Site; however, the cost in terms of actual funding and in elevated worker risk is significant. The analyses also assume certain performance levels for technologies that have not been demonstrated in field conditions similar to Hanford Site tank farms. The evaluations summarized herein are being used to support a decision by representatives of the US Department of Energy, Richland Operations Office, the Washington State Department of Ecology (Ecology), and the US Environmental Protection Agency (EPA) regarding potential further development of subsurface barrier technology.

1096 (WHC-SA-2613) Operational experience in mitigating flammable gas releases from Hanford Site Tank 241-SY-101. Lentsch, J.W.; Babad, H.; Kirch, N.W. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-48: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007776. Source: OSTI; NTIS; INIS; GPO Dep.

Flammable gases consisting of hydrogen, nitrous oxide, ammonia, and methane are periodically released from Hanford Site waste tank 241-SY-101 at concentrations above the flammable limit. A large mixer pump installed in the tank in 1993 has effectively mitigated this problem by continuously releasing small amounts of the flammable gases at the rate they are generated. Tank 241-SY-101 is also equipped with multiple high-sensitivity gas monitoring systems and level detection systems to measure the quantity of gas that is retained in and released from the waste.

1097 (WHC-SA-2617) New methods for determination of interstitial liquid levels in Hanford waste tanks. Barnes, D.A. (Westinghouse Hanford Co., Richland, WA (United States)); Raymond, R.E.; Whitney, P.D. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-49: Waste management '95, Tucson, AZ (United States), 26

Feb - 2 mar 1995). Order Number DE95007778. Source: OSTI; NTIS; INIS; GPO Dep.

The key to the leak detection program for many tanks at Hanford is the method used to evaluate the apparent interstitial liquid interface (ILL) within the pore space of the solid waste medium (either crystalline or sludge). Three new approaches were introduced in the summer of 1993 (count rate, derivative, and sigmoid), all of which significantly improved the accuracy and repeatability of interstitial liquid level values from neutron survey data. This paper summarizes the three new methods and details a case study in which, as a direct result of this improved analysis, a tank that had been declared an "assumed leaker" was reclassified as "sound" for the first time in Hanford's 50 year history.

1098 (WHC-SA-2618) Effectiveness of an effluent retention pond cover to reduce atmospheric source terms. Roblyer, S.P. (Westinghouse Hanford Co., Richland, WA (United States)); Watson, W.T.; Toffer, H.; Owczarski, P.C. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950420-10: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95002467. Source: OSTI; NTIS; INIS; GPO Dep.

The AIRSOURC code calculates the atmospheric source terms of elements, organics, and radionuclides with mathematical models that describe typical facilities in the waste treatment effluent streams. A model of volatile material mass transfer from an uncovered and covered effluent retention basin surface is discussed in this paper. This model can be easily extended to new materials, primarily organic; to extensive US Environmental Protection Agency data libraries; or other sources. The model was used to justify and defend a cover design for large effluent retention basins. The covers were shown to very effectively reduce the release of atmospheric source terms from the retention basins.

1099 (WHC-SA-2639) Progress in resolving Hanford Site high-level waste tank safety issues. Babad, H.; Eberlein, S.J.; Johnson, G.D.; Meacham, J.E.; Osborne, J.W.; Payne, M.A.; Turner, D.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-55: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007780. Source: OSTI; NTIS; INIS; GPO Dep.

Interim storage of alkaline, high-level radioactive waste, from two generations of spent fuel reprocessing and waste management activities, has resulted in the accumulation of 238 million liters of waste in Hanford Site single and double-shell tanks. Before the 1990's, the stored waste was believed to be: (1) chemically unreactive under its existing storage conditions and plausible accident scenarios; and (2) chemically stable. This paradigm was proven incorrect when detailed evaluation of tank contents and behavior revealed a number of safety issues and that the waste was generating flammable and noxious gases. In 1990, the Waste Tank Safety Program was formed to focus on identifying safety issues and resolving the ferrocyanide, flammable gas, organic, high heat, noxious vapor, and criticality issues. The tanks of concern were placed on Watch Lists by safety issue. This paper summarizes recent progress toward resolving Hanford Site high-level radioactive waste tank safety

issues, including modeling, and analyses, laboratory experiments, monitoring upgrades, mitigation equipment, and developing a strategy to screen tanks for safety issues.

1100 (WHC-SA-2651) Evaluation of FTIR-based analytical methods for the analysis of Hanford Site waste. Rebagay, T.V.; Cash, R.J.; Meacham, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950163-2: 3. international on-site analysis conference, Houston, TX (United States), 22-25 Jan 1995). Order Number DE95007774. Source: OSTI; NTIS; INIS; GPO Dep.

Sampling and chemical characterization of mixed high-level waste stored in underground tanks at the Hanford Site is currently in progress. Waste tank safety concerns have provided impetus to analyze this waste. A major safety issue is the possibility of significant concentrations of fuel (ferrocyanide and/or organic compounds) in contact with oxidizers (nitrates and nitrites) that under dry conditions and elevated temperatures could undergo rapid exothermic reactions. To maintain the tanks in a safe condition, data are needed on the moisture and fuel concentrations in the waste. Because of the highly radioactive nature of the waste, non-radioactive waste simulants mimicking actual waste are used to provide an initial basis for identifying realistic waste tank safety concerns. Emphasis has been placed on the use of new or existing Fourier transform infrared (FTIR)-based systems with potential for field or tank deployment to perform in situ remote waste characterization. Three FTIR-based analytical methods have been evaluated. These include (1) fiber optics, (2) modular transfer optics using light guides equipped with non-contact sampling peripherals, and (3) photoacoustic spectroscopy. The attributes of each method for analysis of actual radioactive waste are discussed.

1101 (WHC-SA-2669) Light Duty Utility Arm System applications for tank waste remediation. Carteret, B.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232-8: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95002478. Source: OSTI; NTIS; INIS; GPO Dep.

The Light Duty Utility Arm (LDUA) System is being developed by the US Department of Energy's (DOE's) Office of Technology Development (OTD, EM-50) to obtain information about the conditions and contents of the DOE's underground storage tanks. Many of these tanks are deteriorating and contain hazardous, radioactive waste generated over the past 50 years as a result of defense materials production at a member of DOE sites. Stabilization and remediation of these waste tanks is a high priority for the DOE's environmental restoration program. The LDUA System will provide the capability to obtain vital data needed to develop safe and cost-effective tank remediation plans, to respond to ongoing questions about tank integrity and leakage, and to quickly investigate tank events that raise safety concerns. In-tank demonstrations of the LDUA System are planned for three DOE sites in 1996 and 1997: Hanford, Idaho National Engineering Laboratory (INEL), and Oak Ridge National Laboratory (ORNL). This paper provides a general description of the system design and discusses a number of planned applications of this technology to support the DOE's environmental restoration program, as well as potential applications in other areas. Supporting papers by

other authors provide additional in-depth technical information on specific areas of the system design.

1102 (WHC-SA-2690) Corrosion control of the Hanford Site waste transfer system. Haberman, J.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304-7: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95003945. Source: OSTI; NTIS; GPO Dep.

Corrosion control of the Hanford Site waste transfer system is necessary to assure the system is operational for planned activities leading to successful environmental restoration. Cathodic protection of the Hanford Site waste transfer system has been in existence since the 1940's with acceptable results. The original system was updated with an improved modern design. Energization surveys and a recent baseline survey demonstrate that the existing system operates as intended.

1103 (WHC-SA-2696) Status and progress in sludge washing: A pivotal pretreatment method. Barton, W.B.; MacLean, G.T.; Meng, C.D.; Winkler, C.M. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-62: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006768. Source: OSTI; NTIS; INIS; GPO Dep.

Separation of the bulk soluble chemical salts from the insoluble metal hydroxides and radionuclides is central to the strategy of disposing Hanford tank waste. Sludge washing and caustic leaching have been selected as the primary methods for processing the 230 million L (61,000,000 gal) of Hanford tank waste. These processes are very similar to those selected for processing waste at the West Valley Site in New York and the Savannah River Site in South Carolina. The purpose of sludge washing is to dissolve and remove the soluble salts in the waste. Leaching of the insoluble solids with caustic will be used to dissolve aluminum hydroxide and chromium hydroxide, and convert insoluble bismuth phosphate to soluble phosphate. The waste will be separated into a high-level solids fraction and a liquid fraction that can be disposed of as low-level waste after cesium removal. The washing and leaching operations involve batchwise mixing, settling, and decanting within the existing underground storage tanks.

1104 (WHC-SA-2804) Performance testing of a system for remote ultrasonic examination of the Hanford double-shell waste storage tanks. Pfluger, D.C. (Westinghouse Hanford Co., Richland, WA (United States)); Somers, T.; Berger, A.D. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-112: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95008030. Source: OSTI; NTIS; INIS; GPO Dep.

A mobile robotic inspection system is being developed for remote ultrasonic examination of the double wall waste storage tanks at Hanford. Performance testing of the system includes demonstrating robot mobility within the tank annulus, evaluating the accuracy of the vision based navigation process, and verifying ultrasonic and video system performance. This paper briefly describes the system and

presents a summary of the plan for performance testing of the ultrasonic testing system. Performance test results will be presented at the conference.

1105 (WHC-SD-610-ATP-002) Project B610 process control configuration acceptance test procedure. Silvan, G.R. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 178p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000995. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test is to verify the Westinghouse configuration of the MICON A/S Distributed Control System for project B610. The following will be verified: proper assignment and operation of all field inputs to and outputs from the MICON Termination panels; proper operation of all display data on the operator's console; proper operation of all required alarms; and proper operation of all required interlocks. The MICON A/S control system is configured to replace all the control, indication, and alarm panels now located in the Power Control Room. Nine systems are covered by this control configuration, 2736-ZB HVAC, 234-5Z HVAC, Process Vacuum, Dry Air, 291-Z Closed Loop Cooling, Building Accelerometer, Evacuation Siren, Stack CAMs, and Fire. The 2736-ZB HVAC system consists of the ventilation controls for 2736-ZB and 2736-Z as well as alarms for the emergency generators and 232-Z. The 234-5Z HVAC system is the ventilation controls for 235-5Z and 236-Z buildings. Process Vacuum covers the controls for the 26 inch vacuum system. Dry Air covers the controls for the steam and electric air dryers. The 291-Z Closed Loop Cooling system consists of the status indications and alarms for the 291-Z compressor and vacuum pump closed loop cooling system. The rest of closed loop cooling was tested earlier. The Building Accelerometer system consists of the status indications for the two seismic system accelerometers. The Evacuation Siren system includes the controls for the evacuation and take cover sirens. Stack CAMs cover the alarms for the various building ventilation stack continuous air monitors. Finally, the Fire system covers the various fire alarms now located in Room 321-A.

1106 (WHC-SD-CP-OTR-151) Sludge stabilization operability test report. Lewis, W.S. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004160. Source: OSTI; NTIS; INIS; GPO Dep.

Document provides the results of the Operability Test Procedure performed to test the operability of the HC-21C thermal stabilization process for sludge. The OTP assured all equipment functioned properly and established the baseline temperature profile for glovebox HC-21C.

1107 (WHC-SD-EN-ES-040) Engineering study of 50 miscellaneous inactive underground radioactive waste tanks located at the Hanford Site, Washington. Freeman-Pollard, J.R. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1994. 341p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014123. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering study addresses 50 inactive underground radioactive waste tanks. The tanks were formerly used for the following functions associated with plutonium and uranium separations and waste management activities in the 200 East and 200 West Areas of the Hanford Site:

settling solids prior to disposal of supernatant in cribs and a reverse well; neutralizing acidic process wastes prior to crib disposal; receipt and processing of single-shell tank (SST) waste for uranium recovery operations; catch tanks to collect water that intruded into diversion boxes and transfer pipeline encasements and any leakage that occurred during waste transfer operations; and waste handling and process experimentation. Most of these tanks have not been in use for many years. Several projects have, been planned and implemented since the 1970's and through 1985 to remove waste and interim isolate or interim stabilize many of the tanks. Some tanks have been filled with grout within the past several years. Responsibility for final closure and/or remediation of these tanks is currently assigned to several programs including Tank Waste Remediation Systems (TWRS), Environmental Restoration and Remedial Action (ERRA), and Decommissioning and Resource Conservation and Recovery Act (RCRA) Closure (D&RCP). Some are under facility landlord responsibility for maintenance and surveillance (i.e. Plutonium Uranium Extraction [PUREX]). However, most of the tanks are not currently included in any active monitoring or surveillance program.

1108 (WHC-SD-EN-RD-010) Regulatory analysis for the use of underground barriers at the Hanford Site tank farms. Hampsten, K.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Aug 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000447. Source: OSTI; NTIS; INIS; GPO Dep.

Sixty-seven of the single-shell tanks at the Hanford Site, Richland, Washington, are assumed to have leaked in the past. Some of the waste retrieval options being considered, such as past-practice sluicing (a process that uses hot water to dislodge waste for subsequent removal by pumping), have the potential for increasing releases of dangerous waste from these tanks. Underground barrier systems are being evaluated as a method to mitigate releases of tank waste to the soil and groundwater that may occur during retrieval activities. The following underground barrier system options are among those being evaluated to determine whether their construction at the Single-Shell Tank Farms is viable. (1) A desiccant barrier would be created by circulating air through the subsurface soil to lower and then maintain the water saturation below the levels required for liquids to flow. (2) An injected materials barrier would be created by injecting materials such as grout or silica into the subsurface soils to form a barrier around and under a given tank or tank farm. (3) A cryogenic barrier would be created by freezing subsurface soils in the vicinity of a tank or tank farm. An analysis is provided of the major regulatory requirements that may impact full scale construction and operation of an underground barrier system and a discussion of factors that should be considered throughout the barrier selection process, irrespective of the type of underground barrier system being considered. However, specific barrier systems will be identified when a given regulation will have significant impact on a particular type of barrier technology. Appendix A provides a matrix of requirements applicable to construction and operation of an underground barrier system.

1109 (WHC-SD-EN-TI-223) Geophysical investigation of the SQ Tanks, 221-T Building, 200 West Area. Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005640. Source: OSTI; NTIS; INIS; GPO Dep.

The SQ Tanks are located on the northwest side of the 221-T plant, in the 200-West Area of the Hanford Reservation. The objective of the survey was to locate subsurface obstructions that may affect the removal of tanks and supporting structures. Based upon the results of the survey, obstructions and linears were identified. Access was limited in the survey area due to structures, buildings, and construction work.

1110 (WHC-SD-ER3297-TS-001-Rev.1) Test specification for decant pump and winch assembly. Staehr, T.W. Westinghouse Hanford Co., Richland, WA (United States). 7 Dec 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005439. Source: OSTI; NTIS; INIS; GPO Dep.

This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction arm with load sensing winch control, instrumentation and the associated PLC/PC control system.

1111 (WHC-SD-ER3297-TS-001-Rev.2) Test specification for decant pump and winch assembly. Revision 2. Staehr, T.W. Westinghouse Hanford Co., Richland, WA (United States). 22 Feb 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008433. Source: OSTI; NTIS; INIS; GPO Dep.

This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction with load sensing winch control, instrumentation and the associated PLC/PC control system. All assembly necessary for testing including piping, temporary wiring, etc., shall be performed by the Seller. All referenced figures are at the back of this document. The testing consists of performance testing, winch testing and calibration, instrumentation verification testing and run-in testing of the pump. Testing shall be done in the presence and under the direction of the Buyer in accordance with this procedure.

1112 (WHC-SD-ER3641-ATP-002-Rev.2) Electrical interlock acceptance test procedure for 244-U. Koch, M.R.; Wiggins, D.D. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000345. Source: OSTI; NTIS; GPO Dep.

The attached procedure provides the steps necessary to acceptance test the 244U DCRT electrical interlocks system.

1113 (WHC-SD-ER3641-OTP-001-Rev.1) Operability test procedure for 244-U DCRT. Revision 1. Erhart, M.F. Westinghouse Hanford Co., Richland, WA (United States). 13 Mar 1995. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009104. Source: OSTI; NTIS; INIS; GPO Dep.

This OPT will insure the operability of various systems and their general equipment, used in the operation of the 244-U DCRT. Systems that will be tested include the following: Leak Detection Systems; Heat Trace System; Vessel Temperature Measurement System; Dip Tube Water System; Weight Factor and Specific Gravity System; Instrument Air System; Vessel Liquid Level System; Vessel Liquid

Transfer System; and Exhauster Differential Pressure Indicating Controller System. The tests will cover checks on equipment operation and electrical interlocks, but will not cover checks on associated annunciator alarms which are covered in a separate OTP.

1114 (WHC-SD-ER3641-OTP-004-Rev.1) OTP for 244-U radiation monitoring system. Revision 1. Erhart, M.F. Westinghouse Hanford Co., Richland, WA (United States). 13 Mar 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009160. Source: OSTI; NTIS; INIS; GPO Dep.

This Operability Test Procedure (OTP) will be used to ensure the operability of the beta/gamma alarms for the Continuous Air Monitoring System installed in 244-U DCRT (Double Containment Receiver Tank). The complete system consists of two subsystems: one for Exhaust Stack Monitoring and one for Annulus Monitoring. Completion of this OTP will provide the necessary verification for the operability of the Exhaust Stack and Annulus Monitoring Systems, and for determining the operability of the Receiver Vessel 244-U. This OTP may be performed in conjunction with or following the vendor's Site Acceptance Test Procedure of Continuous Air Monitoring System for 244-U DCRT.

1115 (WHC-SD-FF-EV-002) Test report for run-in acceptance testing of hydrogen mitigation test pump-2. Brewer, A.K.; Kolowith, R. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005141. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the results of the run-in test of the replacement mixer pump for the Tank 241-SY-101. The test was conducted at the 400 Area MASF facility between August 12 and September 29, 1994. The report includes findings, analysis, recommendations, and corrective actions taken.

1116 (WHC-SD-SQA-CSA-20368) CSER 94-004: Criticality safety of double-shell waste storage tanks. Rogers, C.A. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001032. Source: OSTI; NTIS; INIS; GPO Dep.

This criticality safety evaluation covers double-shell waste storage tanks (DSTs), double-contained receiver tanks (DCRTs), vault tanks, and the 242-A Evaporator located in the High Level Waste (HLW) Tank Farms on the Hanford Site. Limits and controls are specified and the basis for ensuring criticality safety is discussed. A minimum limit of 1,000 is placed upon the solids/plutonium mass ratio in incoming waste. The average solids/Pu mass ratio over all waste in tank farms is estimated to be about 74,500, about 150 times larger than required to assure subcriticality in homogeneous waste. PFP waste in Tank-102-SY has an estimated solids/Pu mass ratio of 10,000. Subcriticality is assured whenever the plutonium concentration is less than 2.6 g. The median reported plutonium concentration for 200 samples of waste solids is about 0.01 g (0.038 g/gal). A surveillance program is proposed to increase the knowledge of the waste and provide added assurance of the high degree of subcriticality.

1117 (WHC-SD-SQA-CSA-20373) CSER 94-09: Implications of the heat anomaly in Tank 106-C to criticality

safety. Rogers, C.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001304. Source: OSTI; NTIS; INIS; GPO Dep.

Water is periodically added to Tank C-106 to cool its waste. In March 1994 addition of water was temporarily discontinued to determine if the tank could be adequately cooled at a lower water level. Following an addition of water, a temperature fluctuation was observed on one of the thermocouple trees. This Criticality Safety Evaluation Report (CSER) explains why the anomalous temperature measurements could not have been caused by nuclear criticality. Waste in Tank C-106 was discharged from processing facilities under controls designed to ensure that the contents of the tank would remain well subcritical under all credible conditions. The observed temperature profile does not fit the profile expected from a criticality event. In addition, there has been no indication of any significant increase in the rate of water evaporation.

1118 (WHC-SD-SQA-TA-20011-Rev.1) Technical assessment of workplace air sampling requirements at tank farm facilities: Revision 1. Olsen, P.A. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000679. Source: OSTI; NTIS; INIS; GPO Dep.

WHC-CM-1-6 is the primary guidance for radiological control at Westinghouse Hanford Company (WHC). It was written to implement DOE N 5480.6 "US Department of Energy Radiological Control Manual" as it applies to programs at Hanford which are now overseen by WHC. As such, it complies with Title 10, Part 835 of the Code of Federal Regulations. In addition to WHC-CM-1-6, there is HSRM-1, the "Hanford Site Radiological Control Manual" and several Department of Energy (DOE) Orders, national consensus standards, and reports that provide criteria, standards, and requirements for workplace air sampling programs. This document provides a summary of these, as they apply to WHC facility workplace air sampling programs. This document also provides an evaluation of the compliance of Tank Farms' workplace air sampling program to the criteria, standards, and requirements and documents compliance with the requirements where appropriate. Where necessary, it also indicates changes needed to bring specific locations into compliance.

1119 (WHC-SD-SQA-TA-20011-Rev.2) Technical assessment of workplace air sampling requirements at tank farm facilities: Revision 2. Olsen, P.A.; Brown, R.L. Westinghouse Hanford Co., Richland, WA (United States). 22 Mar 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010104. Source: OSTI; NTIS; INIS; GPO Dep.

Tank Farm facilities compliance with the workplace air sampling (WPAS) program has been assessed. Requirements bases for determining compliance and recommendations are included. In the current condition all buildings are in compliance with the WPAS program. This document also supersedes WHC-SD-SQA-TA-20012, revision 0.

1120 (WHC-SD-TD-RPT-010) Detection and quantitative analysis of ferrocyanide and ferricyanide: FY 93 Florida State University Raman spectroscopy report. Mann, C.K. (Florida State Univ., Tallahassee, FL (United

States). Dept. of Chemistry); Vickers, T.J. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002365. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of work to develop and investigate the feasibility of using Raman spectroscopy with tank waste materials. It contains Raman spectra from organics, such as ethylenediaminetetraacetic acid (EDTA), hydroxyethylenediaminetetraacetic acid (HEDTA), imino diacetic acid (IDA), kerosene, tributyl phosphate (TBP), acetone and butanol, anticipated to be present in tank wastes and spectra from T-107 real and BY-104 simulant materials. The results of investigating Raman for determining moisture content in tank materials are also presented. A description of software algorithms developed to process Raman spectra from a dispersive grating spectrometer system and an initial design for a data base to support qualitative and quantitative application of remote Raman sensing with tank wastes.

1121 (WHC-SD-TD-RPT-011) A summary report on the search for current technologies and developers to develop depth profiling/physical parameter end effectors. Nguyen, Q.H. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 187p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002363. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the search strategies and results for available technologies and developers to develop tank waste depth profiling/physical parameter sensors. Sources searched include worldwide research reports, technical papers, journals, private industries, and work at Westinghouse Hanford Company (WHC) at Richland site. Tank waste physical parameters of interest are: abrasiveness, compressive strength, corrosiveness, density, pH, particle size/shape, porosity, radiation, settling velocity, shear strength, shear wave velocity, tensile strength, temperature, viscosity, and viscoelasticity. A list of related articles or sources for each physical parameters is provided.

1122 (WHC-SD-TD-RPT-012) Vendors search for viscosity sensors for in situ tank waste characterization. Nguyen, Q.H. Westinghouse Hanford Co., Richland, WA (United States). 7 Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002282. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the search results in identifying manufacturers who can develop viscosity sensors for in situ to waste characterization. Six companies were found that have in-process viscometers.

1123 (WHC-SD-TD-WP-0050) LDUA engineering development plan. Engstrom, J.W. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005285. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance to perform Light Duty Utility Arm (LDUA) development work and documentation required to validate the design of the LDUA System. The LDUA system will be used to deploy various types of sensors and devices to demonstrate the technology and qualify the integrated systems for operational use in the Hanford

single shell tanks to characterize the waste inside and assess tank integrity.

1124 (WHC-SD-TP-SEP-024) Safety evaluation for packaging transportation of equipment for tank 241-C-106 waste sluicing system. Calmus, D.B. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 365p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018680. Source: OSTI; NTIS; INIS; GPO Dep.

A Waste Sluicing System (WSS) is scheduled for installation in nd waste storage tank 241-C-106 (106-C). The WSS will transfer high rating sludge from single shell tank 106-C to double shell waste tank 241-AY-102 (102-AY). Prior to installation of the WSS, a heel pump and a transfer pump will be removed from tank 106-C and an agitator pump will be removed from tank 102-AY. Special flexible receivers will be used to contain the pumps during removal from the tanks. After equipment removal, the flexible receivers will be placed in separate containers (packagings). The packaging and contents (packages) will be transferred from the Tank Farms to the Central Waste Complex (CWC) for interim storage and then to T Plant for evaluation and processing for final disposition. Two sizes of packagings will be provided for transferring the equipment from the Tank Farms to the interim storage facility. The packagings will be designated as the WSSP-1 and WSSP-2 packagings throughout the remainder of this Safety Evaluation for Packaging (SEP). The WSSP-1 packagings will transport the heel and transfer pumps from 106-C and the WSSP-2 packaging will transport the agitator pump from 102-AY. The WSSP-1 and WSSP-2 packagings are similar except for the length.

1125 (WHC-SD-TP-SEP-026) Safety Evaluation for Packaging 101-SY Hydrogen Mitigation Mixer Pump package. Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 389p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002079. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Evaluation for Packaging (SEP) provides analysis and considered necessary to approve a one-time transfer of the 101-SY Hydrogen Mitigation Mixer Pump (HMMP). This SEP will demonstrate that the transfer of the HMMP in a new shipping container will provide an equivalent degree of safety as would be provided by packages meeting US Department of Transportation (DOT)/US Nuclear Regulatory Commission (NRC) requirements. This fulfills onsite, transportation requirements implemented by WHC-CM-2-14.

1126 (WHC-SD-W058-FDC-001-Rev.2) Functional design criteria for Project W-058, replacement of cross-site transfer system: Revision 2. Brantley, W.M. Westinghouse Hanford Co., Richland, WA (United States). 26 Aug 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018502. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the functional design criteria for a waste transfer system to pump liquid and slurry waste from the 200 West Area to the 200 East Area, and to facilitate connection for future Tank Waste Remediation System projects. In addition, liquid waste can be transferred from the 200 East Area to the 200 West Area using the existing 200 East Area Tank Farm pumps. The design criteria specified herein are based on policies, procedures, and definitions of safety class systems as identified in DOE Order 6430.1A,

General Design Criteria (DOE 1989); WHC-CM-1-3, Management Requirements and Procedures, MRP 5.46, "Safety Classification of Systems, Components, and Structures"; and HPS-SDC-4.1, "Standard Arch-Civil Design Criteria, Design Loads for Facilities," Revision 12 (RL 1993).

1127 (WHC-SD-W058-WP-001) Engineering work plan for design requirements document, Project W-058/028. Mendoza, D.P. Westinghouse Hanford Co., Richland, WA (United States). 5 Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005672. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan outlines the tasks necessary for developing the Design Requirements Document (DRD) for project W-058/028, Replacement of Cross-Site Transfer System. The DRD is a specification which bounds, at a high level, the requirements of a discrete system element of the Tank Waste Remediation System (TWRS) Program. This document defines the scope and schedule for the development and production of the Design Requirements, Document for Project W-058.

1128 (WHC-SD-W151-ANAL-001) Structural evaluation of thermocouple probes for 241-AZ-101 waste tank. Kanjilal, S.K. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004749. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports on the structural analysis of the thermocouple probe to be installed in 241-AZ-101 waste tank. The thermocouple probe is analyzed for normal pump mixing operation and potential earthquake induced loads required by the Hanford Site Design Criteria SDC-4.1.

1129 (WHC-SD-W151-ATP-001-Rev.1) Project W-151 flexible receiver radiation detector system acceptance test plan. Revision 1. Troyer, G.L. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006596. Source: OSTI; NTIS; INIS; GPO Dep.

The attached document is the Acceptance Test Plan for the portion of Project W-151 dealing with acceptance of gamma-ray detectors and associated electronics manufactured at the Idaho National Engineering Laboratory (INEL). The document provides a written basis for testing the detector system, which will take place in the 305 building (300 Area).

1130 (WHC-SD-W151-ATP-002) Cathodic protection acceptance test procedure. Nordquist, E.M. Westinghouse Hanford Co., Richland, WA (United States). 2 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010226. Source: OSTI; NTIS; INIS; GPO Dep.

This acceptance test procedure is to document testing of added anodes to existing Rectifier No. 11. Anodes were added under Project W-151, Tank 101-AZ Waste Retrieval System.

1131 (WHC-SD-W151-ETP-001) Engineering task plan for the AZ-101 remote visual inspection of internal suspended fixtures and welds. Robinson, R.S. Westinghouse Hanford Co., Richland, WA (United States). 22 Mar 1995. 49p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95010045. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this plan is to present a detailed description of management and examination methods that will be used to accomplish the upcoming remote visual examination of Tank 101-AZ to support Project W151, Tank AZ-101 Waste Retrieval System. This plan will provide: A brief review of the background for this activity; a description of the management structure, ALARA measures, safety class and projected cost/schedule for accomplishing this examination; descriptions of the major elements of the examination, including the remote visual examination system, personnel training and qualifications, examination activities, and reporting requirements.

1132 (WHC-SD-W151-QAPP-001-Rev.2) Project specific quality assurance plan, W-151, Tank 241-AZ-101 waste retrieval system. Revision 2. Manthei, M.E. Westinghouse Hanford Co., Richland, WA (United States). 21 Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004361. Source: OSTI; NTIS; GPO Dep.

This project specific quality assurance program plan establishes the responsibility for the implementation of QA requirements, defines and documents the QA requirements associated with design, procurement, and construction, and defines and documents the degree of QA reviews and verifications on the design and construction necessary to assure compliance to project and DOE requirements. Revision 2 updates the QAPP to provide concurrence with approved work scope deletion. In addition, the Quality Assurance Program Index is being updated to reflect the current Quality Assurance Program requirements per DOE Order 5700.6C.

1133 (WHC-SD-W151-TI-002) Dose rate analysis for Tank 101 AZ (Project W151). Schwarz, R.A.; Hillesland, K.E.; Carter, L.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004363. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the expected dose rates for modification to tank 101 AZ including modifications to the steam coil, mixer pump, and temperature probes. The thrust of the effort is to determine dose rates from: modification of a steam coil and caisson; the installation of mixer pumps; the installation of temperature probes; and estimates of dose rates that will be encountered while making these changes. Because the dose rates for all of these configurations depend upon the photon source within the supernate and sludge, comparisons were also made between measured dose rates within a drywell and the corresponding calculated dose rates. The calculational tool used is a Monte Carlo (MCNP₂) code since complicated three dimensional geometries are involved. A summary of the most important results of the entire study is given in Section 2. The basic calculational geometry model of the tank is discussed in Section 3, along with a tabulation of the photon sources that were used within the supernate and the sludge, and a discussion of uncertainties. The calculated dose rates around the steam coil and caisson before and after modification are discussed in Section 4. The configuration for the installation of the mixer pumps and the resulting dose rates are given in Section 5. The predicted changes in dose rates due to a possible dilution of the supernate source are given in Section 6. The calculational configuration used to model the

installation of temperature probes and the resulting predicted dose rates are discussed in Section 7. Finally, comparisons of measured to calculated dose rates within a drywell are summarized in Section 8. Extended discussions of calculational models and Monte Carlo optimization techniques used are included in Appendix A.

1134 (WHC-SD-W151-WP-005) Project W-151 development work plan for: Tank AZ-101 riser mapping tool and data acquisition system. Crass, D.W. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006782. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies a plan for developing, assembling, and testing a data acquisition system for a 6-inch schedule 40 riser mapping profiler. This plan includes testing and qualifying and integrated system (data acquisition system, riser mapping profiler, and hoist positioner) for plant use. The integrated system supports project W-151 construction activities and will measure diameter, ovality, and vertical alignment of 6-inch risers. Dimensional data will be received by the data acquisition system and stored for later transfer to a portable computer.

1135 (WHC-SD-W178-PMP-001) Project management plan for Project W-178, 219-S secondary containment. Buckles, D.I. Westinghouse Hanford Co., Richland, WA (United States). 26 Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006883. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Management Plan (PMP) establishes the organizational responsibilities, control systems, and procedures for managing the execution of project activities for Project W-178, the 219-S Secondary Containment Upgrade. The scope of this project will provide the 219-S Facility with secondary containment for all tanks and piping systems. Tank 103 will be replaced with a new tank which will be designated as Tank 104. Corrosion protection shall be installed as required. The cells shall be cleaned and the surface repaired as required. The 219-S Waste Handling Facility (219-S Facility), located in the 200 West Area, was constructed in 1951 to support the 222-S Laboratory Facility. The 219-S Facility has three tanks, TK-101, TK-102, and TK-103, which receive and neutralize low level radioactive wastes from the 222-S Laboratory. For purposes of the laboratory, the different low level waste streams have been designated as high activity and intermediate activity. The 219-S Facility accumulates and treats the liquid waste prior to transferring it to SY Tank Farm in the 200-W Area. Transfers are normally made by pipeline from the 219-S Facility to the 241-SY Tank Farm. Presently transfers are being made by tanker truck to the 200-E Area Tank Farms due to the diversion box catch tank which has been removed from service.

1136 (WHC-SD-W178-QAPP-001) Project specific quality assurance plan for Project W-178, 219-S secondary containment. Buckles, D.I. Westinghouse Hanford Co., Richland, WA (United States). 15 Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008855. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this Quality Assurance Program Plan (QAPP) is to provide a system of Quality Assurance reviews

and verifications on the design, procurement and construction of the 219-S Secondary Containment Upgrade. The reviews and verifications will be on activities associated with design, procurement, and construction of the Secondary Containment Upgrade which includes, but is not limited to demolition, removal, new tank installation, tank 103 isolation, tank cell refurbishment, electrical, instrumentation, piping/tubing including supports, pump and valves, and special coatings. The full project scope is defined in the project Functional Design Criteria (FDC), SD-W178-FDC-001, and all activities must be in compliance with this FDC and related design documentation.

1137 (WHC-SD-W211-TDR-001) Title I design summary report, initial tank retrieval systems, project W-211. Rieck, C.A. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 442p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010150. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the Title I (preliminary) design for the Tank 241-SY-101 (101-SY) retrieval system. The design reflects an integrated retrieval approach for 101-SY, whereby the existing mitigation pump will be used to mix the waste and Project W-211 will provide for waste removal. The Title I Design Summary Report includes narrative and sketches that describe the technical aspect of the project, as well as updated cost and schedule baselines for the 101-SY retrieval system.

1138 (WHC-SD-W211-TI-002) Preliminary fire hazards analysis for W-211, Initial Tank Retrieval Systems. Huckfeldt, R.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Mar 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009093. Source: OSTI; NTIS; INIS; GPO Dep.

A fire hazards analysis (FHA) was performed for Project W-211, Initial Tank Retrieval System (ITRS), at the Department of Energy (DOE) Hanford site. The objectives of this FHA was to determine (1) the fire hazards that expose the Initial Tank Retrieval System or are inherent in the process, (2) the adequacy of the fire-safety features planned, and (3) the degree of compliance of the project with specific fire safety provisions in DOE orders and related engineering codes and standards. The scope included the construction, the process hazards, building fire protection, and site wide fire protection. The results are presented in terms of the fire hazards present, the potential extent of fire damage, and the impact on employees and public safety. This study evaluated the ITRS with respect to its use at Tank 241-SY-101 only.

1139 (WHC-SD-W236A-ER-008) Engineering scale mixing system tests for MWTF title II design. Chang, S.C. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002144. Source: OSTI; NTIS; INIS; GPO Dep.

Mixing tests for the Multifunction Waste Tank Facility (MWTF) were conducted in 1/25 and 1/10 scale test tanks with different slurry levels, solids concentrations, different jet mixers and with simulated in-tank structures. The same test procedure was used as in the Title I program, documented in WHC-SD-W236A-ER-005. The test results support the scaling correlation derived previously in the Title I program. The tests also concluded that a partially filled tank requires

less mixing power, and horizontal and angled jets in combination (H/A mixer) are significantly more effective than the two horizontal jet mixers (H/H mixer) when used for mixing slurry with a high solids concentrations.

1140 (WHC-SD-W236A-ER-010) Multi-Function Waste Tank Facility thermal hydraulic analysis for Title II design. Cramer, E.R. Westinghouse Hanford Co., Richland, WA (United States). 10 Nov 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003871. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this work was to provide the thermal hydraulic analysis for the Multi-Function Waste Tank Facility (MWTF) Title II design. Temperature distributions throughout the tank structure were calculated for subsequent use in the structural analysis and in the safety evaluation. Calculated temperatures of critical areas were compared to design allowables. Expected operating parameters were calculated for use in the ventilation system design and in the environmental impact documentation. The design requirements were obtained from the MWTF Functional Design Criteria (FDC). The most restrictive temperature limit given in the FDC is the 200 limit for the haunch and dome steel and concrete. The temperature limit for the rest of the primary and secondary tanks and concrete base mat and supporting pad is 250 F. Also, the waste should not be allowed to boil. The tank geometry was taken from ICF Kaiser Engineers Hanford drawing ES-W236A-Z1, Revision 1, included here in Appendix B. Heat removal rates by evaporation from the waste surface were obtained from experimental data. It is concluded that the MWTF tank cooling system will meet the design temperature limits for the design heat load of 700,000 Btu/h, even if cooling flow is lost to the annulus region, and temperatures change very slowly during transients due to the high heat capacity of the tank structure and the waste. Accordingly, transients will not be a significant operational problem from the viewpoint of meeting the specified temperature limits.

1141 (WHC-SD-W236A-ER-011) Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility. Awadalla, N.G. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001436. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-236a, Multi-function waste Tank Facility (MWTF), was initiated to increase the safe waste storage capacity for the Tank Waste Remediation System (TWRS) by building two new one million gallon underground storage tanks in the 200 West Area and four tanks in the 200 East Area. Construction of the tanks was scheduled to begin in September 1994 with operations beginning in calendar year (CY) 1998. However, recent reviews have raised several issues regarding the mission, scope, and schedule of the MWTF. The decision to build new tanks must consider several elements, such as: Operational risk and needs – Operational risk and flexibility must be managed such that any identified risk is reduced as soon as practicable; The amount of waste that will be generated in the future – Additional needed tank capacity must be made available to support operations and maintain currently planned safety improvement activities; Safety issues – The retrieval of waste from single-shell tanks (SSTs) and watch list tanks will add to the total amount of waste that must be stored in a

double-shell tank (DST); Availability of existing DSTs – The integrity of the 28 existing DSTs must be continuously managed; and Affect on other projects and programs – Because MWTF systems have been integrated with other projects, a decision on one project will affect another. In addition the W-236a schedule is logically tied to support retrieval and safety program plans. Based on the above, two new tanks are needed for safe waste storage in the 200 West Area, and they need to be built as soon as practicable. Design should continue for the tanks in the 200 East Area with a decision made by September, on whether to construct them. Construction of the cross-site transfer line should proceed as scheduled. To implement this recommendation several actions need to be implemented.

1142 (WHC-SD-W236A-ER-014) Computer code input for thermal hydraulic analysis of Multi-Function Waste Tank Facility Title II design. Cramer, E.R. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 514p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004430. Source: OSTI; NTIS; INIS; GPO Dep.

The input files to the P/Thermal computer code are documented for the thermal hydraulic analysis of the Multi-Function Waste Tank Facility Title II design analysis.

1143 (WHC-SD-W236A-ER-015) Life-cycle cost analysis 200-West Weather Enclosure: Multi-function Waste Tank Facility. Umphrey, M.R. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 16 Jan 1995. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005985. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility (MWTF) will provide environmentally safe and acceptable storage capacity for handling wastes resulting from the remediation of existing single-shell and double-shell tanks on the Hanford Site. The MWTF will construct two tank farm facilities at two separate locations. A four-tank complex will be constructed in the 200-East Area of the Hanford Site; a two-tank complex will be constructed in the 200-West Area. This report documents the results of a life-cycle cost analysis performed by ICF Kaiser Hanford Company (ICF KH) for the Weather Enclosure proposed to be constructed over the 200-West tanks. Currently, all tank farm operations on the Hanford Site are conducted in an open environment, with weather often affecting tank farm maintenance activities. The Weather Enclosure is being proposed to allow year-round tank farm operation and maintenance activities unconstrained by weather conditions. Elimination of weather-related delays at the MWTF and associated facilities will reduce operational costs. The life-cycle cost analysis contained in this report analyzes potential cost savings based on historical weather information, operational and maintenance costs, construction cost estimates, and other various assumptions.

1144 (WHC-SD-W236A-ES-003) Material selection for Multi-Function Waste Tank Facility tanks. Carlos, W.C. Westinghouse Hanford Co., Richland, WA (United States). 27 Oct 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003234. Source: OSTI; NTIS; INIS; GPO Dep.

This report briefly summarizes the history of the materials selection for the US Department of Energy's high-level

waste carbon steel storage tanks. It also provide an evaluation of the materials for the construction of new tanks at the Multi-Function Waste Tank Facility. The evaluation included a materials matrix that summarized the critical design, fabrication, construction, and corrosion resistance requirements; assessed each requirement; and cataloged the advantages and disadvantages of each material. This evaluation is based on the mission of the Multi-Function Waste Tank Facility. On the basis of the compositions of the wastes stored in Hanford waste tanks, it is recommended that tanks for the Multi-Function Waste Tank Facility be constructed of normalized ASME SA 516, Grade 70, carbon steel.

1145 (WHC-SD-W236A-ES-005) The effects of lead on multi-function waste tank facility carbon steels. Carlos, W.C. Westinghouse Hanford Co., Richland, WA (United States). 26 Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003167. Source: OSTI; NTIS; INIS; GPO Dep.

Work previously reported in the literature suggests the presence of lead in boiling caustic can crack carbon steel. Further, most of the single-shell tanks presumed to be leakers contain lead from past fuel reprocessing work. While the Multi-Function Waste Tank Facility will be operating at temperatures far below those in which cracking occurred and the waste will have other components including inhibitors, there is a possibility that the lead concentration in some of the waste will exceed that found earlier to cause cracking. Consequently it is recommended that tests be performed on simulated wastes to better define the solubility and to determine whether cracking under proposed operating conditions is a serious concern. However, the experimental evaluation does not need to be performed immediately. The waste believed to have the largest lead concentration, B-Farm, is not shown in the current processing schedule which goes to the year 2011. The wastes scheduled for processing have less than about one-tenth of one percent of the lead concentration found in B-Farm.

1146 (WHC-SD-W236A-ES-011) MWTF path forward engineering analysis technical Task 3.8, Retrieval sequence. Certa, P.J.; Williams, L.S. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011640. Source: OSTI; NTIS; INIS; GPO Dep.

Waste volume projections for the 10-year period ending December 31, 2004 will be used to support the decision of how many waste tanks (if any) should be built by the Multi-Function Waste Tank Facility. Retrieval related assumptions are derived from Tri-Party Agreement milestones and other constraints. Based on the results of an informal sensitivity study, an early retrieval sequence is established. Process facility on-line dates and the interim stabilization (salt-well pumping) schedule are presented. The need for this task as originally defined is waning as the context is rapidly changing and the decision regarding the need for MWTF was made in advance of the task's results. The assumptions used by this task and results must be reevaluated for the new context before using them as a basis for the next OWVP.

1147 (WHC-SD-W236A-MP-001-Rev.1) Management plan – Multi-Function Waste Tank Facility. Revision 1. Fritz, R.L. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930.

Order Number DE95007219. Source: OSTI; NTIS; INIS; GPO Dep.

This Westinghouse Hanford Company (WHC) Multi-Function Waste Tank Facility (MWTF) Management Plan provides guidance for execution WHC MWTF Project activities related to design, procurement, construction, testing, and turnover. This Management Plan provides a discussion of organizational responsibilities, work planning, project management systems, quality assurance (QA), regulatory compliance, personnel qualifications and training, and testing and evaluations. Classified by the US Department of Energy (DOE) as a major systems acquisition (MSA), the MWTF mission is to provide a safe, cost-effective, and environmentally sound method for interim storage of Hanford Site high-level wastes. This Management Plan provides policy guidance and direction to the Project Office for execution of the project activities.

1148 (WHC-SD-W236A-PLN-002) Design review plan for Multi-Function Waste Tank Facility (Project W-236A). Renfro, G.G. Westinghouse Hanford Co., Richland, WA (United States). 20 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005104. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes how the Multi-Function Waste Tank Facility (MWTF) Project conducts reviews of design media; describes actions required by Project participants; and provides the methodology to ensure that the design is complete, meets the technical baseline of the Project, is operable and maintainable, and is constructable. Project W-236A is an integrated project wherein the relationship between the operating contractor and architect-engineer is somewhat different than that of a conventional project. Working together, Westinghouse Hanford Company (WHC) and ICF Karsner Hanford (ICF KH) have developed a relationship whereby ICF KH performs extensive design reviews and design verification. WHC actively participates in over-the-shoulder reviews during design development, performs a final review of the completed design, and conducts a formal design review of the Safety Class I, ASME boiler and Pressure Vessel Code items in accordance with WHC-CM-6-1, Standard Engineering Practices.

1149 (WHC-SD-W236A-PLN-006-Rev.2) Plant Acquisition Plan: Multi-function Waste Tank Facility. Revision 2. McCallum, J.R. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 15 Mar 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009092. Source: OSTI; NTIS; INIS; GPO Dep.

Provides a basis for configuring design packages for construction and procurement activities.

1150 (WHC-SD-W236A-RPT-004) The Multi-Function Waste Tank Facility (MWTF) surplus equipment report. Cruz, V.J.; Epperson, E.M. Westinghouse Hanford Co., Richland, WA (United States). 14 Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004110. Source: OSTI; NTIS; GPO Dep.

This report documents the methods that were utilized to obtain information about the availability and location of government excess equipment. It will also list excess/underused

equipment that could/will be appropriated for use under Project W-236 procurement actions.

1151 (WHC-SD-W236A-SDRD-001-Rev.1) Supplemental design requirements document, Multifunction Waste Tank Facility, Project W-236A. Revision 1. Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 196p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005466. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility (MWTF) consists of four, nominal 1 million gallon, underground double-shell tanks, located in the 200-East area, and two tanks of the same capacity in the 200-West area. MWTF will provide environmentally safe storage capacity for wastes generated during remediation/retrieval activities of existing waste storage tanks. This document delineates in detail the information to be used for effective implementation of the Functional Design Criteria requirements.

1152 (WHC-SD-W236A-TI-004) Recommendation on changing interfaces of W-058 and W-236A. Light, J.M. Westinghouse Hanford Co., Richland, WA (United States). 20 Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005105. Source: OSTI; NTIS; INIS; GPO Dep.

This position paper recommends changes to improve the interface between the Cross-Site Transfer System (Project W-058) and the Multi-Function Waste Tank Facility (Project W-236A) to handle planned waste retrieval and storage operations. Appendix A includes cost estimates and schedule impacts for each project. The cost estimates, schedule impacts, and this position paper will be the basis for writing a change request to formally implement these changes on Project W-236A and Project W-058/W-028. Recommendations are made on pipeline rerouting, pump and configuration, and flushing configuration.

1153 (WHC-SD-W236A-TI-005) Position paper - Waste storage tank heat removal. Stine, M.D. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006599. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a position on the heat removal system to be used on the waste storage tanks currently being designed for the Multi-Function Waste Tank Facility (MWTF), project W-236A. The current preliminary design for the waste storage primary tank heat removal system consists of the following subsystems: (1) a once-through dome space ventilation system; (2) a recirculation dome space ventilation system; and (3) an annulus ventilation system. Recently completed and ongoing studies have evaluated alternative heat removal systems in an attempt to reduce system costs and to optimize heat removal capabilities. In addition, a thermal/heat transfer analysis is being performed that will provide assurance that the heat removal systems selected will be capable of removing the total primary tank design heat load of 1.25 MBtu/hr at an allowable operating temperature of 190 F. Although 200 F is the design temperature limit, 190 F has been selected as the maximum allowable operating temperature limit based on instrumentation sensitivity, instrumentation location sensitivity, and other factors. Seven options are discussed and recommendations are made.

1154 (WHC-SD-W236A-TI-006) Kaiser Engineers Hanford internal position paper – Project W-236A, Multi-function Waste Tank Facility – Peer reviews of selected activities. Stine, M.D. (Kaiser Engineers Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kaiser Engineers Hanford Co., Richland, WA (United States). 4 Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006656. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a proposed position on the performance of independent peer reviews on selected design and analysis components of the Title 1 [Preliminary] and Title 2 [Final] design phases of the Multi-Function Waste Tank Facility [MWTF] project. An independent, third-party peer review is defined as a documented critical review of documents, data, designs, design inputs, tests, calculations, or related materials. The peer review should be conducted by persons independent of those who performed the work, but who are technically qualified to perform the original work. The peer review is used to assess the validity of assumptions and functional requirements, to assess the appropriateness and logic of selected methodologies and design inputs, and to verify calculations, analyses and computer software. The peer review can be conducted at the end of the design activity, at specific stages of the design process, or continuously and concurrently with the design activity. This latter method is often referred to as "Continuous Peer Review."

1155 (WHC-SD-W236A-TI-007) Position paper - tank Inlet air temperatures. Goolsby, G.K. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006630. Source: OSTI; NTIS; INIS; GPO Dep.

Position Paper to develop and document a position on the design inlet air temperature of the heat removal system for the waste storage tanks currently being designed by project W-236A, the MWTF Project.

1156 (WHC-SD-W236A-TI-008) Position paper – Tank ventilation system design air flow rates. Goolsby, G.K. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006631. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to document a project position on required ventilation system design air flow rates for the waste storage tanks currently being designed by project W-236A, the Multi-Function Waste Tank Facility (MWTF). The Title 1 design primary tank heat removal system consists of two systems: a primary tank vapor space ventilation system; and an annulus ventilation system. At the conclusion of Title 1 design, air flow rates for the primary and annulus ventilation systems were 960 scfm and 4,400 scfm, respectively, per tank. These design flow rates were capable of removing 1,250,000 Btu/hr from each tank. However, recently completed and ongoing studies have resulted in a design change to reduce the extreme case heat load to 700,000 Btu/hr. This revision of the extreme case heat load, coupled with results of scale model evaporative testing performed by WHC Thermal Hydraulics, allow for a reduction of the design air flow rates for both primary and annulus ventilation systems. Based on the preceding discussion, ICF

Kaiser Hanford Co. concludes that the design should incorporate the following design air flow rates: Primary ventilation system—500 scfm maximum and Annulus ventilation system—1,100 scfm maximum. In addition, the minimum air flow rates in the primary and annulus ventilation systems will be investigated during Title 2 design. The results of the Title 2 investigation will determine the range of available temperature control using variable air flows to both ventilation systems.

1157 (WHC-SD-W236A-TI-009) Position paper - primary ventilation system configuration. Dalpiaz, E.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006655. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a position on the configuration of the primary ventilation system. This configuration will be used on the waste storage tanks currently being designed for the Multi-Function Waste Tank Facility. The primary ventilation system provides a single treatment train and exhaust fan for each waste storage tank. The ventilation systems from each of two tanks are grouped with an additional treatment train and exhaust fan that function as backup to either of the two systems.

1158 (WHC-SD-W236A-TI-010) Position Paper, W236A/MWTF - tank heat loading. Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006600. Source: OSTI; NTIS; INIS; GPO Dep.

Position Paper to develop and document a position on the selection of the heat removal capability that the MWTF Tank Ventilation Systems will be designed to remove. The purpose of this paper is to provide Project W-236A, Multi-function Waste Tank Facility, (MWTF) Project File documentation on the selection of the heat removal capability that MWTF Tank Ventilation Systems will be designed to remove. This information is necessary for designing a heat removal system to prevent the thermal limits of the tank structure from being exceeded. It is important to note that this paper is not for defining the tank mixer pump requirements, but is to be only used for defining and defending the normal heat generation rate that the ventilation system and other heat removal systems will be designed to remove. There are three main heat loads in the tanks of which two can be controlled to a certain extent through operational considerations. These two are mixing pump heat and heat of chemical addition. The third heat source is radionuclide content which can only be controlled by what wastes are pumped to the tank and whether it is diluted prior to pumping. Other heat loads such as transfer pumps were considered to be negligible. In addition, chemical addition is considered a transient situation that is rarely performed and will be treated as such.

1159 (WHC-SD-W236A-TI-010-Rev.1) Position paper – Tank heat loading. Revision 1. Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006802. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to provide an update to Project W-236A, Multi-function Waste Tank Facility (MWTF), Project File documentation on the selection of the heat removal capability that MWTF Tank Ventilation Systems will be designed to remove. Further scale model mixing tests, as

well as greater understanding of the mission of the tanks and the radionuclide heat load, have shown the current heat removal capabilities to be over-designed. Using the latest available information will decrease the amount of conservatism currently in the design. It is important to note that this paper is not for defining the tank mixer pump requirements, but is to be only used for defining and defending the nominal and extreme case heat generation rate that the ventilation system and other heat removal systems will be designed to remove. There are three main heat loads in the tanks of which two can be controlled to a certain extent through operational considerations. These two are mixing pump heat and heat of chemical addition. The third heat source is radionuclide content which can only be controlled by what wastes are pumped to the tank and whether it is diluted prior to pumping. Other heat loads such as transfer pumps were considered to be negligible. In addition, chemical addition is considered a transient situation that is rarely performed and will be treated as such.

1160 (WHC-SD-W236A-TI-011) Position paper - Tank temperature element location. Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006659. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a position on the number and location of temperature elements to be used in the Project W-236A, Multi-Function Waste Tank Facility (MWTF) waste storage tanks. The current preliminary design for the temperature element (TE) placement in the MWTF waste tanks is essentially a copy of the TE placement in existing Double-Shell Tanks (DST). The basis for the placement of these TEs in existing tanks is not widely documented and was arrived at by consensus of participating engineers. Current designs call for 194 TEs in each tank on the primary tank bottom, sides, support pad, foundation, and on the secondary tank concrete walls, dome, and haunch. An additional 18 TEs are located in the waste itself on a temperature tree. The MWTF project office has determined and is seeking concurrence that temperatures in the primary tank bottom and walls, in the secondary tank concrete walls and dome, and in the primary tank support pad, and in the tank foundation, be monitored primarily in one quadrant instead of all four. It has also been recommended by personnel performing the thermal hydraulic analysis of the tanks that it would be desirable to know the temperature in the annulus air space above the air inlet manifolds where air mixing occurs with air coming from underneath the tanks. TEs will be added in this location.

1161 (WHC-SD-W236A-TI-013) Position paper - Continuous air monitor (CAM) acquisition recommendation. Hughes, M.E. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006598. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this position paper is to document the decision not to acquire continuous air monitors (CAM's) from government excess/surplus supplies. The procurement plan for equipment to be acquired for project W-236A, the Multi-Function Waste Tank Facility (MWTF), stipulates that radiation monitoring equipment will be supplied by WHC via the stock retained within the excess/surplus inventory or utilization of procured instruments from canceled projects.

Technological advances within the radiation detection industry have ultimately outdated the instruments that are available within the excess/surplus stock. These machines represent the technology of the 1970's era. The CAM models in use or within the excess/surplus supplies are obsolete and have been discontinued by the manufacturer. Therefore, the majority of the excess/surplus CAM's are being reacquired and disassembled by instrument shops for in-house acquisition of spare parts for the instruments that are still presently in-service. It is being recommended by W-236A projects department that the strategy to acquire surplus/excess radiation monitoring devices be modified. The recommendation is to directly procure instruments that are equal to the technology available within this industry.

1162 (WHC-SD-W236A-TI-014) Position paper - peer review and design verification of selected activities. Stine, M.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006654. Source: OSTI; NTIS; INIS; GPO Dep.

Position Paper to develop and document a position on the performance of independent peer reviews on selected design and analysis components of the Title I (preliminary) and Title II (detailed) design phases of the Multi-Function Waste Tank Facility project.

1163 (WHC-SD-W236A-TI-016) Seismic design spectra 200 West and East Areas DOE Hanford Site, Washington. Tallman, A.M. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003858. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents equal hazard response spectra for the W236A project for the 200 East and West new high-level waste tanks. The hazard level is based upon WHC-SD-W236A-TI-002, Probabilistic Seismic Hazard Analysis, DOE Hanford Site, Washington. Spectral acceleration amplification is plotted with frequency (Hz) for horizontal and vertical motion and attached to this report. The vertical amplification is based upon the preliminary draft revision of Standard ASCE 4-86. The vertical spectral acceleration is equal to the horizontal at frequencies above 3.3Hz because of near-field, less than 15 km, sources.

1164 (WHC-SD-W236A-TR-001-Rev.1) Multi-function Waste Tank Facility Qualification and Training Plan, Project W-236A. Smith, L.K. Westinghouse Hanford Co., Richland, WA (United States). 1 Dec 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010228. Source: OSTI; NTIS; INIS; GPO Dep.

The MWTF Qualification and Training Plan is being issued as a supporting document for Project W-236A. This plan sets forth the qualification and training requirements for personnel assigned to positions which have a functional impact on the Multi-Functional Waste Tank Facility (MWTF), Project W-236A. Guidance for employee training is provided in the Employee Training Policy, Rev. 0, dated August 12, 1994 and the Training Administration Manual, WHC-CM-2-15. This document contains training plans for Westinghouse Hanford Company (WHC) and ICF Kaiser Hanford Company (ICF KH). Management shall review/update the specific contents semi-annually.

1165 (WHC-SD-W236A-WP-002) **Project W-236A, work plan for preparation of a design requirements document.** Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 10p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006887. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan outlines the tasks necessary, and defines the organizational responsibilities for preparing a Design Requirements Document (DRD) for project W-236A, Multi-Function Waste Tank Facility (MWTF). A DRD is a Systems Engineering document which bounds, at a high level, the requirements of a discrete system element of the Tank Waste Remediation System (TWRS) Program. This system element is usually assigned to a specific project, in this case the MWTF. The DRD is the document that connects the TWRS program requirements with the highest level projects requirements and provides the project's link to the overall TWRS mission. The MWTF DRD effort is somewhat unique in that the project is already in detailed design, whereas a DRO is normally prepared prior to preliminary design. The MWTF design effort was initiated with a Functional Design Criteria (FDC) and a Supplemental Design Requirements Document (SDRD) bounding the high level requirements. Another unique aspect of this effort is that some of the TWRS program requirements are still in development. Because of these unique aspects of the MWTF DRD development, the MWTF will be developed from existing TWRS Program requirements and project specific requirements contained in the FDC and SDRD. The following list describes the objectives of the MWTF DRD: determine the primary functions of the tanks through a functional decomposition of the TWRS Program high level functions; allocate the primary functions to a sub-system architecture for the tanks; define the fundamental design features in terms of performance requirements for the system and subsystems; identify system interfaces and design constraints; and document the results in a DRD.

1166 (WHC-SD-W236B-DRD-001) **Preliminary design requirements document (DRD) for Project W-236B, "Initial Pretreatment Module".** Swanson, L.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Feb 1995. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007789. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this Design Requirements Document (DRD) is to identify and define the functions, with associated requirements, which must be performed to separate Hanford Site tank waste supernatants into low-level and high-level fractions. This document sets forth function requirements, performance requirements, and design constraints necessary to begin conceptual design for the Initial Pretreatment Module (IPM). System and physical interfaces between the IPM project and the Tank Waste Remediation System (TWRS) are identified. The constraints, performance requirements, and transfer of information and data across a technical interface will be documented in an Interface Control Document. Supplemental DRDs will be prepared to provide more detailed requirements specific to systems described in the DRD.

1167 (WHC-SD-W236B-EV-001-Rev.2) **Permitting plan for project W-236B, initial pretreatment module.** Tollefson, K.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 38p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006778. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System pretreatment process mission is to separate high-level and low-level waste fractions. A comprehensive review of environmental regulations has indicated that several environmental reviews, permits, and approvals are required before construction and operation of the facility. This revised document provides a summary of permit application data requirements, alternative strategies for permit completion and approval, as well as the probability of success for each alternative for the Initial Pretreatment Module resulting from recent revisions to the Tri-Party Agreement.

1168 (WHC-SD-W236B-FRD-001) **Functions and requirements for a cesium demonstration unit.** Howden, G.F. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018161. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company is investigating alternative means to pretreat the wastes in the Hanford radioactive waste storage tanks. Alternatives include (but are not limited to) in-tank pretreatment, use of above ground transportable compact processing units (CPU) located adjacent to a tank farm, and fixed processing facilities. This document provides the functions and requirements for a CPU to remove cesium from tank waste as a demonstration of the CPU concept. It is therefore identified as the Cesium Demonstration Unit CDU.

1169 (WHC-SD-W236B-FRD-002-Rev.1) **Functions and requirements for Project W-236B, Initial Pretreatment Module: Revision 1.** Swanson, L.M. Westinghouse Hanford Co., Richland, WA (United States). 22 Nov 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004146. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford Site tank waste supernatants will be pretreated to separate the low-level and high-level fractions. The low-level waste fraction, containing the bulk of the chemical constituents, must be processed into a vitrified waste product which will be disposed of onsite, in a safe, environmentally sound, and cost effective manner. The high-level waste fraction separated during supernatant pretreatment (primarily cesium) will be recombined with an additional high-level waste fraction generated from pretreatment of the tank waste sludges and solids. This combined high-level waste fraction will be immobilized as glass and disposed in a geological repository. The purpose of this document is to establish the functional requirements baseline for Project W-236B, Initial Pretreatment Module, by defining the level 5 and 6 functions and requirements for the project. A functional analysis approach has been used to break down the program functions and associated physical requirements that each function must meet. As the systems engineering process evolves, the design requirements document will replace this preliminary functions and requirements document. The design requirements document (DRD) will identify key decisions and associated uncertainties that impact the project. A revision of this document to a DRD is not expected to change the performance requirements or open issues. However, additional requirements and issues may be identified.

1170 (WHC-SD-W236B-SOW-001) **Statement of work for architect-engineer services, initial pretreatment module.** Sowa, K.B. Westinghouse Hanford Co., Richland, WA

(United States). 15 Sep 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000801. Source: OSTI; NTIS; INIS; GPO Dep.

This Statement of Work describes the Architect-Engineer services to be provided by Raytheon/BNFL in providing a conceptual design (Contract TGW-SVV-063869) for the Initial Pretreatment Module (IPM), Project W-236B, at the Hanford site, Richland, Washington. The IPM Project, a radiochemical process facility, will be designed and constructed for an initial phase of waste pretreatment, which will be for the removal of cesium from supernatant wastes to produce a Low-level waste (LLW) stream to a vitrification facility. The design shall also accommodate side streams of High-Level Waste (HLW) fractions that will be directed to suitable, existing storage tanks where they will be recombined with an additional high-activity waste fraction generated from pretreatment of the tank waste sludges and solids. This combined high-activity waste fraction will be immobilized as glass and disposed in a geological repository.

1171 (WHC-SD-W236B-TI-006) Sludge washing. Peiffer, W.A. Westinghouse Hanford Co., Richland, WA (United States). 3 Mar 1995. 212p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010076. Source: OSTI; NTIS; INIS; GPO Dep.

This study compares the technical merits and economic benefits for in-tank and out-of-tank (in facility) enhanced sludge washing processes. The study evaluates sludge washing/caustic leaching information from various DOE sites and from the BNFL Enhanced Actinide Removal Plant (EARP). The study compares the two processes based on cost analysis, technical merits, final waste volumes, water and chemical usage, safety, schedule impacts, operability, maintainability, and complexity of process interfaces. The study concludes that an out-of-tank process will provide significant cost and performance advantages over in-tank. This study was prepared by Raytheon/BNFL for Westinghouse Hanford Company in support of the Tank Waste Remediation System pretreatment program and project W-236B (Initial Pretreatment Module).

1172 (WHC-SD-W280-ATP-001) Acceptance test procedure for Project W-280. Stites, C.G. Westinghouse Hanford Co., Richland, WA (United States). 27 Oct 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003220. Source: OSTI; NTIS; INIS; GPO Dep.

This Document is the Acceptance Test Procedure for 200 Area C and SY Tank Farm Lighting Upgrade. This Acceptance Test Procedure has been prepared to demonstrate that the Tank Farm Lighting Systems function correctly as required by project criteria and as intended by design.

1173 (WHC-SD-W302-FDC-001) 340 Facility Secondary Containment and Leak Detection Project W-302 Functional Design Criteria. Stordeur, R.T. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008423. Source: OSTI; NTIS; INIS; GPO Dep.

This functional design criteria for the upgrade to the 340 radioactive liquid waste storage facility (Project W-302) specifically addresses the secondary containment issues at the current vault facility of the 340 Complex. This vault serves as the terminus for the Radioactive Liquid Waste

System (RLWS). Project W-302 is necessary in order to bring this portion of the Complex into full regulatory compliance. The project title, "340 Facility Secondary Containment and Leak Detection", illustrates preliminary thoughts of taking corrective action directly upon the existing vault (such as removing the tanks, lining the vault, and replacing tanks). However, based on the conclusion of the engineering study, "Engineering Study of the 300 Area Process Wastewater Handling System", WHC-SD-WM-ER-277 (as well as numerous follow-up meetings with cognizant staff), this FDC prescribes a complete replacement of the current tank/vault system. This offers a greater array of tanks, and provides greater operating flexibility and ease of maintenance. This approach also minimizes disruption to RLWS services during "tie-in", as compared to the alternative of trying to renovate the old vault. The proposed site is within the current Complex area, and maintains the receipt of RLWS solutions through gravity flow.

1174 (WHC-SD-W314B-DA-002) Tank vapor mitigation requirements for Hanford Tank Farms. Rakestraw, L.D. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 634p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004424. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company has contracted Los Alamos Technical Associates to listing of vapors and aerosols that are or may be emitted from the High Level Waste (HLW) tanks at Hanford. Mitigation requirements under Federal and State law, as well as DOE Orders, are included in the listing. The lists will be used to support permitting activities relative to tank farm ventilation system up-grades. This task is designated Task 108 under MJB-SWV-312057 and is an extension of efforts begun under Task 53 of Purchase Order MPB-SVV-03291 5 for Mechanical Engineering Support. The results of that task, which covered only thirty-nine tanks, are repeated here to provide a single source document for vapor mitigation requirements for all 177 HLW tanks.

1175 (WHC-SD-W314-FRD-001) Functions and requirements for tank farm restoration and safe operations, Project W-314. Revision 3. Garrison, R.C. Westinghouse Hanford Co., Richland, WA (United States). 1 Feb 1995. 283p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006790. Source: OSTI; NTIS; INIS; GPO Dep.

This Functions and Requirements document (FRD) establishes the basic performance criteria for Project W-314, in accordance with the guidance outlined in the letter from R.W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," 94-PRJ-018, dated 3/18/94. The FRD replaces the Functional Design Criteria (FDC) as the project technical baseline documentation. Project W-314 will improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farm facilities and systems. The scope of Project W-314 encompasses the necessary restoration upgrades of the Tank Farms' instrumentation, ventilation, electrical distribution, and waste transfer systems.

1176 (WHC-SD-W314-PLN-001) Preparation plan, preliminary safety documentation, tank farm restoration

and safe operations, Project W-314. Kidder, R.J. Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003162. Source: OSTI; NTIS; INIS; GPO Dep.

This preparation plan is developed to establish planning for the preliminary safety documentation for Project W-314, "Tank Farm Restoration and Safe Operations."

1177 (WHC-SD-W320-ANAL-002) Seismic evaluation of Tank 241C106 in support of retrieval activities. Wallace, D.A. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 796p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003241. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241C106 (C106) is a domed, single-shell high-level waste storage tank that has been in service in the 200 East Area of the Hanford Site since 1947. Tank C106 is one of twelve tanks in a 4 x 3 array with a 100-ft center-to-center spacing. Each of the tanks is approximately 75 ft in diameter, 24-ft high at the haunch, and 33-ft high at the dome apex. The level of waste in C106 and the associated thermal environment have varied throughout the life of the tanks with the peak temperature in the concrete reaching approximately 300 F at the base of the tank in the mid-1970's (Bander 1992). The calculated peak temperature in the concrete has decreased since that time to approximately 200 F. The peak temperature occurs at the inside bottom of the tank; concrete temperatures in the wall and dome are less than 130 F. The waste inside the tank is primarily solid matter approximately 7- to 8-ft deep. The tank is completely buried in dry, sandy soil to a depth of approximately 6 ft at the dome apex. The in situ evaluation of C106 documented in July 1994 includes only the effects of gravity and thermal loads. A preliminary seismic evaluation of C106 considering only horizontal excitation demonstrated the finite-element program SASSI (A System for Analysis of Soil-Structure Interaction) and provided an estimate of seismic effects including soil-to-structure interaction. This final seismic evaluation expands on the preliminary seismic evaluation to include further verification and refinement of analysis parameters, quantification to tank-to-tank and waste-to-tank interaction, and examination of the effects of vertical seismic excitation. The concrete structure of tank C106 is classified as a Safety Class 1 non-reactor structure.

1178 (WHC-SD-W320-ANAL-003) Tank 241C106 structural evaluation in support of Project W320 retrieval. Wallace, D.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 1821p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003363. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241C106 structural evaluation to support W320. It includes ACI code input and riser evaluations. This work uses the in situ conditions established by Jylyk to develop a three-dimensional model of the tank. Non-axisymmetric loads associated with retrieval activities are applied to assess their influence on structural integrity of the tank. This study addresses loads associated with normal operation and credible accident scenarios. The concrete structure of tank C106 is classified as a Safety Class I non-reactor structure in accordance with the definition given in SDC 4.1. The operating specifications document (OSD) limits applicable to tank C106 include a live load limit for the C Tank Farm of

100 tons. For the technical basis of this limit, the OSD references SD-RE-TI-012, which qualifies the 100 tons as that distributed over a 10-ft radius. However, there is no specification for a uniform live load that would accompany natural hazard phenomena such as snow or ash fall. There is no specific guidance on crane loads applied at the surface outside the tank radius. Further, there is no record of any seismic analysis of tanks in the C Tank Farm. The analysis documented in this report evaluates nonseismic conditions that include a concentrated live load, a uniform live load, and a crane load, in addition to the in situ loads. The model documented in this study also is used to provide the non-seismic stress contribution to the seismic load combination documented by Wallace.

1179 (WHC-SD-W320-CBA-001) W-320 pit liner vs. coating cost risk benefit analysis. Symons, G.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010077. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the costs and the risk trade-offs associated with the two pit lining or confinement options being considered as part of the Tank 241-C-106 Waste Retrieval Project. Both of these pit secondary confinement options (i.e., stainless steel pit liners and epoxy coating) can be implemented in a fashion that complies with criteria for secondary containment systems specified by the Washington Administration Codes (WAC-173-303-604). Direct life cycle costs of the two options including design, fabrication, installation, radiation, exposure, and decontamination and disposal costs are compared. Risk is expressed as probability weighted with the confinement consequences that could be mitigated by the pit liner. The risk impact of the choice of the confinement option is also evaluated in the context of the overall risk associated with the sluicing project and continued storage of the high-heat waste in the Tank 241-C-106 pending completion of the W-320 Project. The two pit secondary containment options are stainless steel line and epoxy coating.

1180 (WHC-SD-W320-DA-001) Structural analysis of the equipment removal system for tanks 241C106 and 241AY102. Mackey, T.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 238p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005289. Source: OSTI; NTIS; INIS; GPO Dep.

The calculations documented in this report show that the ERS major components are structurally qualified to complete the objective: install the removed equipment into a shipping container, transport and store the container at the Central Waste Complex (CWC). The analysis for the structural members of the ERS components considers live load with an impact factor of 125% and dead load. An allowable stress of 1/3 yield is used for all structural components carrying the load based on DOE-RL-92-36. Adherence to DOE-RL-92-36 is not a code requirement. However, due to the loads considered, this factor of safety is appropriate. The calculations meet the strength requirements of the American Institute for Steel Construction (AISC 1989) for all non-critical structural elements.

1181 (WHC-SD-W320-DA-004) Spool assembly support analysis. Norman, B.F. Westinghouse Hanford Co., Richland, WA (United States). 7 Oct 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95003280. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the wind/seismic analysis and evaluation for the pump pit spool assemblies. Hand calculations were used for the analysis. UBC, AISC, and load factors were used in this evaluation. The results show that the actual loads are under the allowable loads and all requirements are met.

1182 (WHC-SD-W320-DA-005) Shot loading platform analysis. Norman, B.F. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003278. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the wind/seismic analysis and evaluation for the shot loading platform. Hand calculations were used for the analysis. AISC and UBC load factors were used in this evaluation. The results show that the actual loads are under the allowable loads and all requirements are met.

1183 (WHC-SD-W320-DA-006) Shot loading trainer analysis. Peterson, T.K. Westinghouse Hanford Co., Richland, WA (United States). 15 Feb 1995. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007788. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results from the analysis of the shot loading trainer (SLT). This device will be used to test the procedure for installing shot into the annulus of the Project W-320 shipping container. To ensure that the shot is installed uniformly around the container, vibrators will be used to settle the shot. The SLT was analyzed to ensure that it would not jeopardize worker safety during operation. The results from the static analysis of the SLT under deadweight and vibrator operating loads show that the stresses in the SLT are below code allowables. The results from the modal analysis show that the natural frequencies of the SLT are far below the operating frequencies of the vibrators, provided the SLT is mounted on pneumatic tires. The SLT was also analyzed for wind, seismic, deadweight, and moving/transporting loads. Analysis of the SLT is in accordance with SDC-4.1 for safety class 3 structures (DOE-RL 1993) and the American Institute of Steel Construction (AISC) Manual of Steel Construction (AISC 1989).

1184 (WHC-SD-W320-PMP-001-Rev.2) Project management plan for Project W-320, Tank 241-C-106 sluicing: Revision 2. Phillips, D.R. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 251p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001310. Source: OSTI; NTIS; INIS; GPO Dep.

A major mission of the US Department of Energy (DOE) is the permanent disposal of Hanford Site defense wastes by utilizing safe, environmentally acceptable, and cost-effective disposal methods that meet applicable regulations. The Tank Waste Remediation System (TWRS) Program was established at the Hanford Site to manage and control activities specific to the remediation of safety watch list tanks, including high-heat-producing tanks, and for the ultimate characterization, retrieval, pretreatment, and disposal of the low- and high-level fractions of the tank waste. Project W-320, Tank 241-C-106 Sluicing, provides the methodology, equipment, utilities, and facilities necessary for retrieving the high-heat waste from single-shell tank (SST) 24-C-106.

Project W-320 is a fiscal year (FY) 1993 expense-funded major project, and has a design life of 2 years. Retrieval of the waste in tank 241-C-106 will be accomplished through mobilization of the sludge into a pumpable slurry using past-practice sluicing. The waste is then transferred directly to a double-shell tank for interim storage, subsequent pretreatment, and eventual disposal. A detailed description of the management organization and responsibilities of all participants is presented in this document.

1185 (WHC-SD-W320-PMP-001-Rev.3) Project management plan for Project W-320, Tank 241-C-106 sluicing. Phillips, D.R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 270p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005298. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Management Plan establishes the organization, plans, and systems for management of Project W-320 as defined in DOE Order 4700.1, Project Management System (DOE 1987).

1186 (WHC-SD-W320-QAPP-001-Rev.1) Project Specific Quality Assurance Plan (QAPP). Huston, J.J. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004474. Source: OSTI; NTIS; INIS; GPO Dep.

The Project QAPP's describe the program and the planned actions which WHC will implement to demonstrate and ensure that the project meets the requirements of DOE Order 5700.6C. The Project involves retrieving the high-heat waste from Tank 241-C-106 to close the safety issue associated with the tank, demonstrate initial waste retrieval technology for a Single Shell Tank, and provide feed for the Hanford Waste Vitrification Plant.

1187 (WHC-SD-W320-TC-002) Project W-320 Heel Jet Secondary Catch Mechanism lateral load test. Belomy, J.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002089. Source: OSTI; NTIS; GPO Dep.

This test procedure establishes the requirements for performing a lateral load test of the Heel Jet Secondary Catch Mechanism (SCM). Successful performance of this test will demonstrate that the SCM is capable of performing as designed when subjected to a force applied normal to the longitudinal axis of the mechanism. This test procedure is prepared following the recommended format and content guidelines for test procedures as prescribed in WHC-IP-1026, Engineering Practice Guidelines, Appendix K, Test Plans, Specifications, Procedures and Reports.

1188 (WHC-SD-W320-TIS-001) Qualification test for the flexible receiver. Keller, C.M. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001037. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the test plan and procedures to certify and design verify the 42 inch and 4-6 inch Flexible Receiver (FR) is a safety class 3 system. Verification of the design will be handled in two parts. The first part will be to show that it meets design requirements set forth by documents and the second part will perform test(s) to verify its operational aspects. To qualify the design of the FR systems for field use this test will demonstrate environmentally safe

removal of a Tank Farm pump mock-up from a Tank Farm riser mock-up. Testing will also demonstrate the performance of supporting equipment. The FR and the Secondary Bagging (SB) equipment shall be tested to verify successful operation of the equipment to the following criteria: The FR can be placed on a riser and connections made to the supporting equipment; The FR bag can accept equipment and be successfully sealed; The SB system encases the seal of the primary FR bag; The flexible bag(s) do not tear and maintain integrity during the entire test; The FR control system operates in the fail safe forced sequence mode; The FR control system will operate in the manual override mode (out of sequence operations); The CCTV Video system monitors and records the removal of the test item; The spray wash system operates without leaks and effectively provides coverage; The item being removed can be reinserted to a depth of 8 feet and the bag reinstalled onto the vertical bag supports; and The system prohibits momentary mechanical fluctuations due to the application of system power, including power interruptions.

1189 (WHC-SD-W320-TIS-001-Rev.1) Qualification test for the Flexible Receiver: Revision 1. Keller, C.M. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003068. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the test plan and procedures to certify and design verify the 42 in. and 4 in. - 6 in. Flexible Receiver as a safety class 3 system. The Flexible Receiver will be used by projects W-151 and W-320 for removing equipment from tanks C-106 and Az-101.

1190 (WHC-SD-W320-TIS-001-Rev.2) Qualification test for the flexible receiver. Revision 2. Tedeschi, D.J. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005214. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the test plan and procedures to certify and design verify the 42" and 4"-6" Flexible Receiver as a safety class 3 system. The Flexible Receiver will be used by projects W-151 and W-320 for removing equipment from tanks C-106 and AZ-101.

1191 (WHC-SD-W320-TIS-001-Rev.3) Qualification testing for the flexible receiver. Tedeschi, D.J. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010106. Source: OSTI; NTIS; INIS; GPO Dep.

This document shows how the Flexible Receiver equipment has been qualified for field use in the field as safety class 3. This is divided into 3 parts. The first part describes how the equipment met the governing rules applied to it by both the design requirements and the other applicable DOE orders. The second part is a test procedure that is applicable to any Flexible Receiver. It currently applies to the 42 inch and 4/6 inch. Attached in the appendices are the signed test sheets. This equipment will be used for removing equipment from tanks at Tank Farm.

1192 (WHC-SD-W320-TRP-001) Project W320 heel jet secondary catch mechanism lateral load test - test report. Bellomy, J.R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 22p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007787. Source: OSTI; NTIS; INIS; GPO Dep.

This test report summarizes testing activities and documents the results of the lateral load test performed on the Heel Jet Secondary Catch Mechanism.

1193 (WHC-SD-W320-TRP-002) Project W320 52-inch diameter equipment container load test: Test report. Bellomy, J.R. Westinghouse Hanford Co., Richland, WA (United States). 22 Feb 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008421. Source: OSTI; NTIS; INIS; GPO Dep.

This test report summarizes testing activities and documents the results of the load tests performed on-site and off-site to structural qualify the 52-inch equipment containers designed and fabricated under Project W-320.

1194 (WHC-SD-W340-ECOR-001) Project W-340 tank 241-C-106 manipulator system closeout summary. McDaniel, L.B. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 476p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010079. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the work that was ongoing when Project W-340 was put on hold. Project W-340: Tank 241-C-106 Manipulator Retrieval System, was a candidate FY98 Major System Acquisition. The project was to develop, procure and deploy a Long Reach Manipulator (LRM) waste retrieval system to provide an alternate method to completing the in-tank demonstration of Single Shell Tank waste retrieval technology. The need for enhanced capabilities derives from (1) the inability of the baseline technology to retrieve certain hard waste forms; (2) uncertainty in the quantity of leakage which will be allowed. Numerous studies over the years have identified an arm architecture as a promising retrieval technology to overcome these concerns. The W340 project was intended to further develop and demonstrate this alternative, as part of selecting the best approach for all tanks. Prior to completing the effort, it was determined that an LRM system was too architecture specific and was envisioned to be too expensive for a one time demonstration of retrieval technology. At the time the work was stopped, an effort was underway to broaden the project scope to allow alternatives to an arm-based system.

1195 (WHC-SD-W340-ES-002) Project W-340 long reach arm retrieval system balance of plant instrumentation workshop engineering study. Schneider, T.C. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004785. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering study documents the results of a workshop held to resolve Issue No. 26 generated at a Arm Based Retrieval Functional Analysis Value Engineering Session. The issue deals with the scope of the Balance of Plant Instrumentation needs for the LRARS.

1196 (WHC-SD-W340-SEL-002) Preliminary safety equipment list for Tank 241-C-106 Manipulator Retrieval System, Project W-340. Guthrie, R.L. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000987. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the anticipated safety classification of the estimated major subsystems, based on the projected major functions, that will be used as guidance for the development of the conceptual design of the Manipulator Retrieval System for Tank 241-C-106. This document is intended to be updated as the design of the Manipulator Retrieval System evolves through the conceptual and definitive design phases. The Manipulator Retrieval System is to be capable of removing the hardened sludge heel at the bottom of single shell Tank 241-C-106 and to perform an overall clean out of the tank that leaves a maximum of 360 ft³ (TPA milestone M-45-00). The thickness of the heel prior to initiation of waste retrieval with the Manipulator Retrieval System is estimated to be 1- to 2-ft. The Manipulator Retrieval System is currently in the pre-conceptual phase with no definitive systems or subsystems. The anticipated retrieval functions for the Manipulator Retrieval System is based on Table 6-2 of WHC-SD-W340-ES-001, Rev. 1. Projected equipment to accomplish these functions were based on the following systems and equipment: Rotary Mode Core Sampling Equipment (WHC-SD-WM-SEL-032); Light Duty Utility Arm System Equipment (WHC-SD-WM-SEL-034); Single Shell Tanks Equipment (WHC-SD-WM-SEL-020).

1197 (WHC-SD-W340-WP-002) Permitting plan for Project W-340, Tank 241-C-106 manipulator retrieval arm. Tollefson, K.S. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004498. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the regulatory requirements and describes alternative strategies for obtaining permits and approvals for Project W-340, Tank 241-C-106 Manipulator Retrieval Arm. A comprehensive review of environmental regulations has indicated that several environmental reviews, permits, and approvals are required before design, construction, and operation of the facility. The environmental reviews, permits, and approvals, as well the regulatory authority potentially applicable to the Project W-340 Long Reach Manipulator Arm include the following: National Environmental Policy Act of 1969 – US Department of Energy, Headquarters; State Environmental Policy Act of 1971 – State of Washington Department of Ecology; Air Permitting; Dangerous Waste Permitting; Miscellaneous Reviews/Permits/Approvals. This document describes the environmental reviews, permits, and approval requirements for the project. It provides a summary of permit application data requirements, alternative strategies for permit completion and approval, as well as the estimated probability of success for each alternative strategy.

1198 (WHC-SD-W402-CR-001-Rev.1) Design criteria tank farm storage and staging facility: Revision 1. Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000351. Source: OSTI; NTIS; INIS; GPO Dep.

Tank Farms Operations must store/stage material and equipment until work packages are ready to work. Consumable materials are also required to be stored for routine and emergency work. Connex boxes and open storage is currently used for much of the storage because of the limited space at 272AW and 272WA. Safety issues based on poor housekeeping and material deteriorating due to weather damage has resulted from this inadequate storage space. It

has been determined that a storage building in close proximity to the Tank Farm work force would be cost effective. Project W-402 and W-413 will provide a storage/staging area in 200 East and West Areas by the construction of two new storage facilities. The new facilities will be used by Operations, Maintenance and Materials groups to adequately store material and equipment. These projects will also furnish electrical services to the facilities for lighting and HVAC. Fire Protection shall be extended to the 200 East facility from 272AW if necessary.

1199 (WHC-SD-W402-CR-001-Rev.2) Design criteria tank farm storage and staging facility. Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006884. Source: OSTI; NTIS; INIS; GPO Dep.

Tank Farms Operations must store/stage material and equipment until work packages are ready to work. Consumable materials are also required to be stored for routine and emergency work. Safety issues based on poor housekeeping and material deterioration due to weather damage has resulted from inadequate storage space. It has been determined that a storage building in close proximity to the Tank Farm work force would be cost effective. This document provides the design criteria for the design of the storage and staging buildings near 272AW and 272WA buildings.

1200 (WHC-SD-W402-FHA-001) Fire hazards analysis, east tank farm storage and staging facility. Lott, D.T.; Huckfeldt, R.A. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005065. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the fire hazards of the proposed storage and staging buildings near the 278AW facility.

1201 (WHC-SD-W413-FHA-001) Fire hazards analysis for W-413, West Area Tank Farm Storage and Staging Facility. Huckfeldt, R.A.; Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005073. Source: OSTI; NTIS; INIS; GPO Dep.

In accordance with DOE Order 5480.7A, a Fire Hazards Analysis must be performed for all new facilities. The purpose of the analysis is to comprehensively assess the risk from fire within individual fire areas in relation to proposed fire protection so as to ascertain whether the fire protection objectives of the Order are met. The Order acknowledges a graded approach commensurate with the hazards involved. Tank Farms Operations must store/stage material and equipment such as pipes, fittings, conduit, instrumentation and others related items until work packages are ready to work. Consumable materials, such as nut, bolts and welding rod, are also required to be stored for routine and emergency work. Connex boxes and open storage is currently used for much of the storage because of the limited space at and 272WA. Safety issues based on poor housekeeping and material deteriorating due to weather damage has resulted from this inadequate storage space. It has been determined that a storage building in close proximity to the Tank Farm work force would be cost effective. This facility is classified as a safety class 4 building.

1202 (WHC-SD-WM-ABU-001) SY tank farm ventilation inlet filters and inlet stack acceptance for beneficial

use. Wilder, A.E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010073. Source: OSTI; NTIS; INIS; GPO Dep.

This document formally demonstrates that the ABU process for the SY tank farm inlet filters and SY-101 inlet stack has been properly completed in accordance with the approved ABU checklist. For each item required on the ABU checklist, a bibliography of the documentation prepared and released to satisfy the requirement is provided. A copy of the approved inlet filter/inlet stack ABU checklist is also attached. Release of this document signifies that the tank farm operations, engineering, and maintenance organizations have accepted responsibility for the SY tank farm ventilation inlet filters and the SY-101 inlet stack.

1203 (WHC-SD-WM-ANAL-014) S Tank Farm SL-119 saltwell piping failure analysis report. Carlos, W.C. Westinghouse Hanford Co., Richland, WA (United States). 5 Aug 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018156. Source: OSTI; NTIS; INIS; GPO Dep.

On January 24, 1992, while pressure testing saltwell line SL-119 in the 241-S Tank Farm, water was observed spraying out of heat trace enclosure. The SL-115, SL-116, SN-215, and SN-216 saltwell lines also recently failed pressure testing because of leaks. This study documents the pertinent facts about the SL-119 line and discusses the cause of the failures. The inspection of the SL-119 failure revealed two through-the-wall holes in the top center of the pipeline. The inspection also strongly suggests that the heat tracing system is directly responsible for causing the SL-119 failure. Poor design of the heat tracing system allowed water to enter, condense, and collect in the electric metallic tubing (EMT) carbon steel conduits. Water flowed to the bottom of the elbow of the conduit and corroded out the elbow. The design also allowed drifting desert sand to enter into the conduit and fall to the bottom (elbow) of the conduit. The sand became wet and aided in the corrosion of the elbow of the conduit. After the EMT conduits corroded though, the water dripped from the corroded ends of the EMT conduits onto the top of the saltwell pipe, corroding the two holes into the top of the line. If the heat tracing hot splice box had not allowed moisture to enter the EMT conduits, the saltwell piping would not have corroded and caused SL-119 to fail.

1204 (WHC-SD-WM-ANAL-018) Structural evaluation of Tank 241-AN-107 internal components for caustic addition mixing operations. Julyk, J.L. Westinghouse Hanford Co., Richland, WA (United States). 6 Oct 1994. 428p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002210. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to evaluate the structural adequacy of the in-tank components for the additional loads imposed by the operation of the mixing pump. Two load conditions are considered. The normal operating load condition is comprised of the pump-induced hydraulic forces under steady-state conditions and the deadweight of the components. This also includes the forces from the flow-induced vibrations at resonance conditions. The extreme load condition is defined to be the normal operating load condition plus the seismically-induced forces, including the forces resulting from sloshing of the tank's contents. An evaluation of the tank risers and dome structure is not within the scope of this report.

1205 (WHC-SD-WM-ANAL-020-Rev.1) PUREX Plant waste analysis plan: Revision 1. Ellis, M.W. Westinghouse Hanford Co., Richland, WA (United States). 15 Aug 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003076. Source: OSTI; NTIS; INIS; GPO Dep.

A Washington Administrative Code 173-303-300 requires that a facility shall develop and follow a written analysis plan which describes the procedures that will be followed to ensure that its dangerous wastes are managed properly. This document covers the activities at the PUREX Plant to characterize and designate waste that is generated within the plant and stored in Tanks F18 and U3/U4 prior to transfer to Tank Farms.

1206 (WHC-SD-WM-ANAL-029) Stress analysis of portable safety platform (Core Sampler Truck). Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010136. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the stress analysis and evaluation of the portable platform of the rotary mode core sampler truck No. 2 (RMCST #2). The platform comprises railing, posts, deck, legs, and a portable ladder; it is restrained from lateral motion by means of two brackets added to the drill-head service platform.

1207 (WHC-SD-WM-ANAL-033-Vol.1) 241-AP waste storage tanks: Supplemental gravity load analysis: Volume 1. Julyk, L.J. Westinghouse Savannah River Co., Aiken, SC (United States). 25 Aug 1994. 161p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018727. Source: OSTI; NTIS; INIS; GPO Dep.

Using static, linear analysis techniques, the reinforced concrete tanks have been evaluated for soil (depth and density) loads and concentrated load (applied at grade above the tanks) greater than those in the original design analysis. The original seismic, thermal creep and concrete aging analyses/assumptions have not been changed.

1208 (WHC-SD-WM-ANAL-033-Vol.2) 241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2. Julyk, L.J.; Baliga, R. Westinghouse Hanford Co., Richland, WA (United States). 16 Aug 1994. 277p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018728. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains compiled data of supplemental gravity load analyses for radioactive storage tanks.

1209 (WHC-SD-WM-ANAL-034-Vol.1) 241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1. Baliga, R. Westinghouse Hanford Co., Richland, WA (United States). 26 Aug 1994. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018467. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis of the 241SY tanks performed by AD-VENT(1994b) to resolve dome overload issues indicated that the tank can sustain the dome loads resulting from additional soil overburden depth, increased soil density, and increased concentrated load. Similar issues exist for the 241AY/AZ tanks and therefore, an interim analysis of the 241AY/AZ tanks is presented herein. The scope of this effort is to review and compare all design drawings pertaining to

the 241AY and 241AZ tanks with those pertaining to the 241SY tanks; to modify the axisymmetric model of the 241SY tanks to represent the 241AY/AZ tanks; and to evaluate the effect of additional dome load on the 241AY/AZ tanks by performing a structural analysis for gravity loads (dead load + live load). ADVENTS's additional scope of work is to perform a qualitative evaluation of the 241AY/AZ tanks for seismic and thermal loadings (Vollert 1982 and Blume 1971). This qualitative evaluation does not include any detailed finite element analysis of the tanks. The following design-based gravity loading conditions are used in this interim analysis of the 241AY/AZ tanks to determine a baseline for the tank stresses or section loads.

1210 (WHC-SD-WM-ANAL-034-Vol.2) 241-AV/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2. Julyk, L.J.; Baliga, R. Westinghouse Hanford Co., Richland, WA (United States). 17 Aug 1994. 546p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018468. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains compiled data of supplemental gravity load analyses for radioactive storage tanks.

1211 (WHC-SD-WM-ANAL-035-Vol.1) 241-AW/AN waste storage tanks: Supplemental gravity load analysis: Volume 1. Julyk, L.J. Westinghouse Hanford Co., Richland, WA (United States). 19 Aug 1994. 229p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019003. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis of the 241SY tanks performed by ADVENT(1994b) to resolve dome overload issues indicated that the tank can sustain the dome loads resulting from additional soil overburden depth, increased soil density, and increased concentrated load. Similar issues exist for the 241AW/AN tanks and therefore, an interim analysis of the 241AW/AN tanks is presented herein. The scope of this effort is to review and compare all design drawings pertaining to the 241AW and 241AN tanks with those pertaining to the 241SY tanks; to modify the axisymmetric model of the 241SY tanks to represent the 241AW/AN tanks; and to evaluate the effect of additional dome load on the 241AW/AN tanks by performing a structural analysis for gravity loads (dead load + live load). ADVENT's additional scope of work is to perform a qualitative evaluation of the 241AW/AN tanks for seismic and thermal loadings (Blume 1976). This qualitative evaluation does not include any detailed finite element analysis of the tanks. Volume 1 of this report contains the text and calculations. Volume 2 contains a printed copy of the computer files used in these analyses.

1212 (WHC-SD-WM-ANAL-035-Vol.2) 241-AW/AN waste storage tanks: Supplemental gravity load analysis: Volume 2. Julyk, L.J. Westinghouse Hanford Co., Richland, WA (United States). 19 Aug 1994. 434p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019004. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis of the 241SY tanks performed by ADVENT(1994b) to resolve dome overload issues indicated that the tank can sustain the dome loads resulting from additional soil overburden depth, increased soil density, and increased concentrated load. Similar issues exist for the 241AW/AN tanks and therefore, an interim analysis of the 241AW/AN tanks is presented herein. The scope of this effort is to review and compare all design drawings pertaining

to the 241AW and 241AN tanks with those pertaining to the 241SY tanks; to modify the axisymmetric model of the 241SY tanks to represent the 241AW/AN tanks; and to evaluate the effect of additional dome load on the 241AW/AN tanks by performing a structural analysis for gravity loads (dead load + live load). ADVENT's additional scope of work is to perform a qualitative evaluation of the 241AW/AN tanks for seismic and thermal loadings (Blume 1976). This qualitative evaluation does not include any detailed finite element analysis of the tanks. Volume 1 of this report contains the text and calculations. Volume 2 contains a printed copy of the computer files used in these analyses.

1213 (WHC-SD-WM-ANAL-036) 241-SY modular exhaust pad analysis. Kriskovich, J.R. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004157. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to show the analytical results which were reached in analyzing the new 241-SY modular exhaust concrete pad and retaining wall. The analysis covers wind loading (80 mph), an equivalent static load due to a seismic event, and from those two results, a determination of the pad thickness and the location and size of reinforcement bar was made. The analysis of the exhaust assembly and sampling cabinet evaluated overturning of the assemblies as a whole. An analysis was then performed for the bolting requirements for these two assemblies. The reason why this was broken up into components was to determine if the individual components could take the load exerted by the workset case loading condition, whether it be wind or seismic. The retaining wall that will be located near the new concrete pad was also analyzed. The retaining wall was evaluated to determine the area of reinforcement required, the location of reinforcement, as well as the mass and configuration of the wall to prevent overturning or sliding. The wall was considered Non-Safety Class 4. Additional piping was required to tie-in the new exhaust to the existing primary ventilation ductwork. The design for the tie-in includes two butterfly valves, a tee fitting, elbows, flanges, straight pipe sections, and two new pipe supports to accommodate the additional weight. The valves will enable the new and existing exhausters to be isolated independently. The ductwork, couplings, and supports were analyzed for structural adequacy given Safety Class 2 loads.

1214 (WHC-SD-WM-ANAL-043) Estimates of laboratory accuracy and precision on Hanford waste tank samples. Dodd, D.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006786. Source: OSTI; NTIS; INIS; GPO Dep.

A review was performed on three sets of analyses generated in Battelle, Pacific Northwest Laboratories and three sets generated by Westinghouse Hanford Company, 222-S Analytical Laboratory. Laboratory accuracy and precision was estimated by analyte and is reported in tables. The sources used to generate this estimate is of limited size but does include the physical forms, liquid and solid, which are representative of samples from tanks to be characterized. This estimate was published as an aid to programs developing data quality objectives in which specified limits are established. Data resulting from routine analyses of waste matrices can be expected to be bounded by the precision and accuracy estimates of the tables. These tables do not

preclude or discourage direct negotiations between program and laboratory personnel while establishing bounding conditions. Programmatic requirements different than those listed may be reliably met on specific measurements and matrices. It should be recognized, however, that these are specific to waste tank matrices and may not be indicative of performance on samples from other sources.

1215 (WHC-SD-WM-AP-005-Rev.5) **Single-shell tank leak emergency pumping guide. Revision 5.** Wiggins, D.D. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005626. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides general information on all Single-Shell Tank Farms about readiness and special concerns for Emergency Pumping and identifies the required actions when a Single-Shell tank is identified as a leaking tank. Tank Transfer Routes are described, possible heat trace circuits are outlined, and tank riser status and obstructions are documented. Locations of existing saltwell systems and spares, information on emergency pumping equipment, watch list tank status, and transfer line integrity assessments are all included. A matrix of required actions to emergency pump individual tanks, and lists of useful drawings, procedures, work procedure outlines, and references are also provided.

1216 (WHC-SD-WM-AP-019-Rev.1) **Double-shell tank ultrasonic inspection plan. Revision 1.** Pfluger, D.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001544. Source: OSTI; NTIS; INIS; GPO Dep.

The waste tank systems managed by the Tank Waste Remediation System Division of Westinghouse Hanford Company includes 28 large underground double-shell tanks (DST) used for storing hazardous radioactive waste. The ultrasonic (UT) inspection of these tanks is part of their required integrity assessment (WAC 1993) as described in the tank systems integrity assessment program plan (IAPP) (Pfluger 1994a) submitted to the Ecology Department of the State of Washington. Because these tanks hold radioactive waste and are located underground examinations and inspections must be done remotely from the tank annuli with specially designed equipment. This document describes the UT inspection system (DSTI system), the qualification of the equipment and procedures, field inspection readiness, DST inspections, and post-inspection activities. Although some of the equipment required development, the UT inspection technology itself is the commercially proven and available projection image scanning technique (P-scan). The final design verification of the DSTI system will be a performance test in the Hanford DST annulus mockup that includes the demonstration of detecting and sizing corrosion-induced flaws.

1217 (WHC-SD-WM-AP-031) **Double shell tanks emergency pumping plan.** Tangen, M.J. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1994. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001376. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the Department of Energy (DOE), a formal plan for the emergency transfer of waste from a leaking double shell tank to a designated receiver tank has been developed. This plan is in response to the priority 2 safety

issue "Response to a leaking double-shell tank" in the DOE Report to Congress, 1991. The plan includes the tanks in four of the east tank farms and one of the west farms. The background information and supporting calculations used for the creation of the emergency plan are discussed in this document. The scope of this document is all of the double shell tanks in the AN, AP, AW, AY, and SY farms. The transfer lines, flush pits, and valve pits involved in the transfer of waste between these farms are also included in the scope. Due to the storage of high heat waste, AZ farm is excluded at this time.

1218 (WHC-SD-WM-AP-035) **Technical task plan for Acquire Commercial Technology for Retrieval.** McDaniel, L.B. Westinghouse Hanford Co., Richland, WA (United States). 7 Apr 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010192. Source: OSTI; NTIS; INIS; GPO Dep.

Objective is to determine from industry their best approaches to retrieving waste from the Single Shell Tanks. This task plan describes the first 18 months of work; the task will be further defined as the work progresses. The retrieval is to be demonstrated on tank 241-C-106.

1219 (WHC-SD-WM-ATP-023-Rev.5) **Tank Monitor and Control System sensor acceptance test procedure. Revision 5.** Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001560. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this acceptance test procedure (ATP) is to verify the correct reading of sensor elements connected to the Tank Monitor and Control System (TMACS). This ATP is intended to be used for testing of the connection of existing temperature sensors, new temperature sensors, pressure sensing equipment, new Engraf level gauges, sensors that generate a current output, and discrete (on/off) inputs. It is intended that this ATP will be used each time sensors are added to the system. As a result, the data sheets have been designed to be generic. The TMACS has been designed in response to recommendations from the Defense Nuclear Facilities Safety Board primarily for improved monitoring of waste tank temperatures. The system has been designed with the capability to monitor other types of sensor input as well.

1220 (WHC-SD-WM-ATP-023-Rev.6) **Tank Monitor and Control System sensor acceptance test procedure. Revision 6.** Scaief, C.C. III. Westinghouse Savannah River Co., Aiken, SC (United States). 2 Nov 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003063. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Acceptance Test Procedure (ATP) is to verify the correct reading of sensor elements connected to the Tank Monitor and Control System (TMACS). The system functional requirements are contained in WHC-SD-WM-RD-013, Rev. 1 (WHC 1992a). This ATP is intended to be used for testing of the connection of existing temperature sensors, new temperature sensors, pressure sensing equipment, new Enraf level gauges, sensors that generate a current output, and discrete (on/off) inputs. The TMACS operation was verified by the original ATP (WHC 1991 c). It is intended that this ATP will be used each time sensors are

added to the system. As a result, the data sheets have been designed to be generic.

1221 (WHC-SD-WM-ATP-063-Rev.1) Acceptance test procedures for rotary mode core sampling exhausters. Robinson, J.D. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010139. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this ATP is to provide systematic acceptance testing of two rotary mode core sampling exhausters. These exhausters will support core sampling systems three and four. The exhaust gases are monitored for radionuclides, ammonia, and total organics.

1222 (WHC-SD-WM-ATP-069-Rev.2) Acceptance test procedure for tank bottom thermocouples on Tank 241-SY-101. Revision 2. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 25 Oct 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003158. Source: OSTI; NTIS; INIS; GPO Dep.

This ECN incorporates a complete procedure revision for testing the re-installation of a temporary Data Logger which is to be installed in support of upcoming mixer pump excavation runs.

1223 (WHC-SD-WM-ATP-077-Rev.2) Enraf Series 854 advanced technology gauge (ATG) acceptance test procedure. Revision 2. Barnes, G.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006907. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure checks that the shipment of the gauge to Hanford did not cause a failure. This procedure provides acceptance testing for Enraf Series 854 level gauges used to monitor levels in Hanford Waste Storage Tanks. The test will verify that the gauge functions according to the manufacturer's instructions and specifications and is properly setup prior to being delivered to the tank farm area. Enraf-Nonius Series 854 level gauges are certified by Factory Mutual (FM) for National Fire Protectional Association (NFPA 70) hazardous Class 1, Division 1, Groups B, C, and D Locations. Its measuring principle is based on the detection of variations in the weight of a displacer suspended in the process fluid. The displacer is connected to a wire wound on a precision measuring drum. A level change causes a change in the weight of the displacer which will be detected by the force transducer. Electronics within the gauge cause a servo motor to adjust the position of the displacer and compute the tank level based on the new position of the displacer drum. The gauge displays the level in decimal inches. An analog output signal transmits the level data for remote data processing.

1224 (WHC-SD-WM-ATP-080) Acceptance test procedure for SY Tank Farm replacement exhauster unit. Becken, G.W. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005081. Source: OSTI; NTIS; INIS; GPO Dep.

The proper functioning of a new 241-SY Tank Farm replacement exhauster will be acceptance tested, to establish operability and to provide an operational baseline for the equipment. During this test, a verification of all of the alarm

and control circuits associated with the exhaust, which provide operating controls and/or signals to local and remote alarm/annunciator panels, shall be performed. Test signals for sensors that provide alarms, warnings, and/or interlocks will be applied to verify that alarm, warning, and interlock setpoints are correct. Alarm and warning lights, controls, and local and remote readouts for the exhauster will be verified to be adequate for proper operation of the exhauster. Testing per this procedure shall be conducted in two phases. The first phase of testing, to verify alarm, warning, and interlock setpoints primarily, will be performed in the MO-566 Fab Shop. The second phase of testing, to verify proper operation and acceptable interface with other tank farm systems, will be conducted after the exhauster and all associated support and monitoring equipment have been installed in the SY Tank Farm. The exhauster, which is mounted on a skid and which will eventually be located in the SY tank farm, receives input signals from a variety of sensors mounted on the skid and associated equipment. These sensors provide information such as: exhauster system inlet vacuum pressure; prefilter and HEPA filter differential pressures; exhaust stack sampler status; exhaust fan status; system status (running/shut down); and radiation monitoring systems status. The output of these sensors is transmitted to the exhauster annunciator panel where the signals are displayed and monitored for out-of-specification conditions.

1225 (WHC-SD-WM-ATP-082) DACS upgrade acceptance test procedure. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001373. Source: OSTI; NTIS; INIS; GPO Dep.

The readiness of the Data Acquisition and Control System (DACS) to provide monitoring and control of the mixer pump, directional drive system, and the instrumentation associated with the SY-101 tank and support systems, and the proper functioning of the DACS with new Model 984-785 Programmable Logic Controllers (PLCs), new MODBUS PLUS version 2.01 software for the PLCs, and version 3.72 of the GENESIS software will be systematically evaluated by performance of this procedure. The DACS, which is housed in a trailer located just outside of the north fence at the SY tank farm, receives input signals from a variety of sensors located in and around the SY-101 tanks. These sensors provide information such as: tank vapor space and ventilation system H₂ concentration; tank waste temperature; tank pressure; waste density; operating pump parameters such as speed, flow, rotational position, discharge pressure, and internal temperature; strain (for major equipment); and waste level. The output of these sensors is conditioned and transmitted to the DACS computers where these signals are displayed, recorded, and monitored for out-of-specification conditions. If abnormal conditions are detected, then, in certain situations, the DACS automatically generates alarms and causes the system to abort pump operations.

1226 (WHC-SD-WM-ATP-092) Acceptance test procedure, 241-SY-101 flexible receiver system, Phase II testing. Ritter, G.A. Westinghouse Hanford Co., Richland, WA (United States). 25 Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003163. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure is for the 241-SY-101 Flexible Receiver System. The procedure will test the

strength of the containment bag assembly by subjecting the bag assembly to a load test.

1227 (WHC-SD-WM-ATP-093) Acceptance test procedure, 241-SY-101 Flexible Receiver System, Phase III testing. Ritter, G.A. Westinghouse Hanford Co., Richland, WA (United States). 21 Nov 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004510. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure is for the 241-SY-101 Flexible Receiver System, Phase III Testing. This procedure will test the sealing integrity of the Flexible Receiver System to ensure that release of waste and aerosols will be minimized during the removal of the test mixer pump from tank SY-101.

1228 (WHC-SD-WM-ATP-096) Standard-C hydrogen monitoring system acceptance test procedure. Schneider, T.C. Westinghouse Hanford Co., Richland, WA (United States). 2 Sep 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019006. Source: OSTI; NTIS; INIS; GPO Dep.

The primary function of the standard-C hydrogen monitoring system (SHMS) is to monitor specifically for hydrogen in the waste tank atmosphere which may also contain (but not be limited to) unknown quantities of air, nitrous oxide, ammonia, water vapor, carbon dioxide, carbon monoxide, and other gaseous constituents. The SHMS will consist of hydrogen specific monitors, a grab sampler to collect samples for laboratory analysis, a gas chromatograph, and the gas sample collection system necessary to support the operation of the instrumentation. This system will be located in a cabinet placed at the tank of interest. The purpose of this document is to demonstrate that the SHMS is constructed as intended by design.

1229 (WHC-SD-WM-ATP-098) GMS/DACS interface acceptance test procedure. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000680. Source: OSTI; NTIS; INIS; GPO Dep.

The readiness of the Data Acquisition and Control System (DACS) to provide monitoring of existing, and newly installed, instrumentation associated with the SY-101 tank Gas Monitoring Systems will be systematically evaluated by performance of this procedure. All new alarms will be verified to function at the required setpoints. The change of I/O Drop 17 to I/O Drop 13 will be checked to verify that all associated alarms and screen displays are correct. All new or changed Control Screens which provide operator interface with the Gas Monitoring Systems readouts during operations will be verified to be adequate and correct. The DACS, which is housed in a trailer located just outside of the north fence at the SY tank farm, receives input signals from a variety of sensors located in and around the SY-101 tank. These sensors provide information such as: tank vapor space and ventilation system H₂ concentration; tank waste temperature; tank pressure; waste density; operating pump parameters such as speed, flow, rotational position, discharge pressure, and internal temperature; strain (for major equipment); and waste level. The output of these sensors is conditioned and transmitted to the DACS computers where these signals are displayed, recorded, and monitored for out-of-specification conditions. If abnormal conditions are

detected, then, in certain situations, the DACS automatically generates alarms and causes the system to abort pump operations. The portions of the system to be tested include: new RGA5 gas monitor; existing gas chromatographs; FTIR; B&K (Photo) NH₃ equipment; any new or changed Genesis screens; and I/O Drop 13.

1230 (WHC-SD-WM-ATP-100) Acceptance test procedure, 241-SY-101/241-C-106 shot loading system. Ostrom, M.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002142. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure is for the 241-SY-101/241-C-106 Shot Loading System. The procedure will test the components of the Shot Loading System and its capability of adequately loading shot into the annular space of the Container. The loaded shot will provide shielding as required for transporting and storage of a contaminated pump after removal from the tank. This test serves as verification that the SLS is acceptable for use in the pump removal operations for Tanks 241-SY-101, 241-C-106 and 241-AY-102. The pump removal operation for these three tanks will be performed by two different organizations with different equipment, but the Shot Loading System will be compatible between the two operations.

1231 (WHC-SD-WM-ATP-106) Acceptance test procedure for the 241-SY-101 flexible receiver gamma detector system. Aftanas, B.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005098. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure is for the 241-SY-101 Flexible Receiver Gamma Detector System.

1232 (WHC-SD-WM-ATP-107) MIT upgrade acceptance test procedure. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003276. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure will test the 17B MIT sensor inputs to the DACS trailer after installation of new thermocouple multiplexers and associated computer software.

1233 (WHC-SD-WM-ATP-107-Rev.1) MIT upgrade acceptance test procedure. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005681. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure will test the 17B MIT sensor inputs to the DACS trailer after installation of new thermocouple multiplexers and associated computer software.

1234 (WHC-SD-WM-ATP-112) Factory Acceptance Test Procedure Westinghouse 100 ton Hydraulic Trailer. Aftanas, B.L. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kamp Systems, Ontario, CA (United States). 16 Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003781. Source: OSTI; NTIS; INIS; GPO Dep.

This Factory Acceptance Test Procedure (FAT) is for the Westinghouse 100 Ton Hydraulic Trailer. The trailer will be used for the removal of the 101-SY pump. This procedure includes: safety check and safety procedures; pre-operation check out; startup; leveling trailer; functional/proofoad test; proofoad testing; and rolling load test.

1235 (WHC-SD-WM-ATP-113) **Inspection system performance test procedure.** Jensen, C.E. Westinghouse Hanford Co., Richland, WA (United States). 17 Jan 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005989. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure establishes requirements to administer a performance demonstration test. The test is to demonstrate that the double-shell tank inspection system (DSTIS) supplied by the contractor performs in accordance with the WHC-S-4108, Double-Shell Tank Ultrasonic Inspection Performance Specification, Rev. 2-A, January, 1995. The inspection system is intended to provide ultrasonic (UT) and visual data to determine integrity of the Westinghouse Hanford Company (WHC) site underground waste tanks. The robotic inspection system consists of the following major sub-systems (modules) and components: Mobile control center; Deployment module; Cable management assembly; Robot mechanism; Ultrasonic testing system; Visual testing system; Pneumatic system; Electrical system; and Control system.

1236 (WHC-SD-WM-ATP-119) **Acceptance test procedure for core sample trucks.** Smalley, J.L. Westinghouse Hanford Co., Richland, WA (United States). 17 Mar 1995. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010070. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Acceptance Test Procedure is to provide instruction and documentation for acceptance testing of the rotary mode core sample trucks, HO-68K-4600 and HO-68K-4647. The rotary mode core sample trucks were based upon the design of the second core sample truck (HO-68K-4345) which was constructed to implement rotary mode sampling of the waste tanks at Hanford. Acceptance testing of the rotary mode core sample trucks will verify that the design requirements have been met. All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions. Compressed air will be substituted for nitrogen during the majority of testing, with nitrogen being used only for flow characterization.

1237 (WHC-SD-WM-ATP-122) **Void fraction instrument software, Version 1.1., acceptance test procedure.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005472. Source: OSTI; NTIS; INIS; GPO Dep.

Provides the plan and procedures for the acceptance test of changes that result in Version 1.1 of void fraction software. The void fraction instrument measures gas by volume in waste storage tanks.

1238 (WHC-SD-WM-ATP-124) **Nitrogen chiller acceptance test procedure.** Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008881. Source: OSTI; NTIS; INIS; GPO Dep.

This document includes the inspection and testing requirements for the Nitrogen Chiller unit. The Chiller will support the Rotary Mode core Sampling System during the summer. The Chiller cools the Nitrogen Purge Gas that is used when drilling in tank wastes to cool the drill bit.

1239 (WHC-SD-WM-ATP-127) **Acceptance test procedure for the ultra high pressure bore head for use in the self-installing liquid observation well.** Hertelendy, N.A. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010140. Source: OSTI; NTIS; INIS; GPO Dep.

In order to monitor waste stored in single-shell tanks, liquid observation wells (LOWs) are installed to permit periodic insertion of instrumentation probes to evaluate the waste cross sections. An ultra high pressure water bore head, developed for installing instrument trees, was adapted for use with the LOWs. The modification facilitates the removal of the high pressure water feed system after installation. This document describes a series of tests that ensures that the design meets all the functional requirements.

1240 (WHC-SD-WM-ATR-044) **Acceptance test report for 241-AW process air system.** Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 6 Oct 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002237. Source: OSTI; NTIS; INIS; GPO Dep.

The acceptance test procedure (ATP) for the compressed air system at building 241-AW-273 was completed on March 11, 1993. The system was upgraded to provide a reliable source of compressed air to the tank farm. The upgrade included the demolition of the existing air compressor and associated piping, as well as the installation of a new air compressor with a closed loop cooling system. A compressed air cross-tie was added to allow the process air compressor to function as a back-up to the existing instrument air compressor. The purpose of the ATP was to achieve three primary objectives: verify system upgrade in accordance with the design media; provide functional test of system components and controls; and prepare the system for the Operational Test. The ATP was successfully completed with thirteen exceptions, which were resolved prior to completing the acceptance test. The repaired exceptions had no impact to safety or the environment and are briefly summarized. Testing ensured that the system was installed per design, that its components function as required and that it is ready for operational testing and subsequent turnover to operations.

1241 (WHC-SD-WM-ATR-057) **Acceptance test report for 241-T-701 instrument air system.** Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010197. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) provides the record of the results of acceptance testing of the instrument air compressor, air dryer, and filtering system located in 241-T-701.

1242 (WHC-SD-WM-ATR-066) **Acceptance Test Report for 241-U compressed air system.** Freeman, R.D. Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006828. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) documents the results of acceptance testing of a newly upgraded compressed air system at 241-U Farm. The system was installed and the test successfully performed under work package 2W-92-01027.

1243 (WHC-SD-WM-ATR-069-Rev.1) Acceptance test report for tank bottom thermocouples on Tank 241-SY-101. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005076. Source: OSTI; NTIS; INIS; GPO Dep.

This test report documents testing performed per WHC-SD-WM-ATP-069, Rev. 2. The proper monitoring of the 241-SY-101 Tank Bottom and Side Thermocouples (TBSTC) by the Data Acquisition and Control System (DACS) will be tested to establish continued operability of the system. During this test, an end-to-end verification of all of the sensor circuits associated with the TBSTCs, which provide signals both to the DACS computer system and an installed temporary Data Logger, shall be performed by injecting a signal at the appropriate field terminal and verifying the circuit completely through the system to the computer in the DACS trailer and the computer monitor used to display the output of the Data Logger. Each injected signal will be adjusted for appropriate 'near zero', 'mid range' and 'near full scale' values for the sensor being tested. The TBSTC screen, which provides for operator interface with the TBSTCs, will be utilized to monitor testing at the DACS computers. Testing per this procedure shall be conducted after the installation of the temporary Data Logger for the TBSTCs is complete. The temporary Data Logger will be installed to monitor the temperature readings of 13 of the 26 Tank Bottom Thermocouples in support of SY-101 excavation testing.

1244 (WHC-SD-WM-ATR-078) Standard-B hydrogen monitoring system acceptance test report. Tran, T.T. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000349. Source: OSTI; NTIS; INIS; GPO Dep.

Test Engineering was supported by Tank Waste Remediation System Safety Programs Engineering Support in the performance of an Acceptance Test Procedure (ATP) to qualify the Standard Hydrogen Monitoring System (SHMS) cabinet installed on waste tank 241-SY-103. The June 7, 1994 ATP performance was controlled by West Waste Tank Farms work package 2W-94-322. The ATP was conducted following the final installation of a second Whittaker electrochemical hydrogen monitoring cell. The cabinet had been sited on the waste tank two years earlier, but never connected to the exhaust vent header to monitor Tank 241-SY-103 vent header exhaust gases. The cabinet was then modified, to remove two undesirable solid state hydrogen monitors and install a second Whittaker electrochemical hydrogen monitoring sensor and signal conditioning. The ATP was used to assure that the cabinet wiring and components were properly installed and labeled and that the two years without operation had not seriously damaged the installed equipment. Electrical and pneumatic tests were performed to assure system integrity.

1245 (WHC-SD-WM-ATR-081) Software acceptance test report for Tank 101-SY void fraction instrument. Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 19p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001543. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of the acceptance test for the software that was developed to operate the void fraction instrument for Tank 101-SY. Together with the ATP, this document satisfies the requirements in EP 4.1, "Design Verification Requirements." The selected method of design verification is qualification testing. The testing described in this document covers the software that controls and acquires data for the 101-SY void fraction instrument. In addition to the software, this testing verifies and validates the data acquisition and control hardware for the void fraction instrument. A separate acceptance test will be performed for the mechanical features not related to software.

1246 (WHC-SD-WM-ATR-082) DACS upgrade acceptance test report. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 229p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005293. Source: OSTI; NTIS; INIS; GPO Dep.

The DACS, which is housed in a trailer located just outside of the north fence at the SY tank farm, receives input signals from a variety of sensors located in and around the SY-101 tank. These sensors provide information such as: (1) tank vapor space and ventilation system H₂ concentration; (2) tank waste temperature; (3) tank pressure; (4) waste density; (5) operating pump parameters such as speed, flow, rotational position, discharge pressure, and internal temperature; (6) strain (for major equipment); and (7) waste level. The output of these sensors is conditioned and transmitted to the DACS computers where these signals are displayed, recorded, and monitored for out-of-specification conditions. If abnormal conditions are detected, then, in certain situations, the DACS automatically generates alarms and causes the system to abort pump operations. The report documents testing performed per WHC-SD-WM-ATP-082. Rev. 0-13.

1247 (WHC-SD-WM-ATR-084) Multiport riser and flange assemblies acceptance test report. Precechtel, D.R.; Schroeder, B.K. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000347. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of the acceptance test for the multiport riser (MPR) and multiport flange (MPF) assemblies. The accepted MPR and MPF assemblies will be used in support of the hydrogen mitigation project for double-shell waste tank 241-SY-101 and other related projects. The testing described in this document verifies that the mechanical and interface features are operating as designed and that the unit is ready for field service. The objectives of the acceptance testing were as follows: Basic equipment functions and mechanical interfaces were verified; Installation and removal of equipment were demonstrated to the degree possible; Operation of the decon spray system and all valving was confirmed; and the accumulated leak rate of the MPR and MPF assemblies was determined.

1248 (WHC-SD-WM-ATR-088) Mini-DACS acceptance test report. Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003071. Source: OSTI; NTIS; INIS; GPO Dep.

The attached document is the acceptance test summary report, of the mini-DACS, that was used to test the spare mixer pump for tank 241-SY-101, at the maintenance and storage facility (MASF). It includes a copy of the acceptance test procedure (ATP) and all pertaining ECNS.

1249 (WHC-SD-WM-ATR-094) Acceptance Test Report for 241-SY Pump Cradle Hydraulic System. Koons, B.M. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009095. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this ATP is to verify that hydraulic system/cylinder procured to replace the cable/winch system on the 101-SY Mitigation Pump cradle assembly fulfills its functional requirements for raising and lowering the cradle assembly between 70 and 90 degrees, both with and without pump. A system design review was performed on the 101-SY Cradle Hydraulic System by the vendor before shipping (See WHC-SD-WM-DRR-045, 241-SY-101 Cradle Hydraulic System Design Review). The scope of this plan focuses on verification of the systems ability to rotate the cradle assembly and any load through the required range of motion.

1250 (WHC-SD-WM-ATR-098) GMS/DACS Interface acceptance test report. Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002075. Source: OSTI; NTIS; INIS; GPO Dep.

The DACS, which is housed in a trailer located just outside of the north fence at the SY tank farm, receives input signals from a variety of sensors located in and around the SY-101 tank. These sensors provide information such as: tank vapor space and ventilation system H_2 concentration; tank waste temperature; tank pressure; waste density; operating pump parameters such as speed, flow, rotational position, discharge pressure, and internal temperature; strain (for major equipment); and waste level. The output of these sensors is conditioned and transmitted to the DACS computers where these signals are displayed, recorded, and monitored for out-of-specification conditions. If abnormal conditions are detected, then, in certain situations, the DACS automatically generates alarms and causes the system to abort pump operations. The portions of the system to be tested include: new RGA5 gas monitor; existing gas chromatographs; FTIR; B and K (Photo) NH_3 equipment; any new or changed Genesis screens; and I/O Drop 13.

1251 (WHC-SD-WM-ATR-103) Void fraction instrument acceptance test procedure. Stokes, T.I.; Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003236. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of the acceptance test for the mechanical and electrical features (not specifically addressed by the software ATP) of the void fraction instrument (VFI). Acceptance testing of the VFI, control console, and decontamination spray assembly was conducted in the 306E building high bay and area adjacent to the facility. The VFI was tested in the horizontal position supported in multiple locations on rolling tables. The control console was located next to the VFI pneumatic control assembly. The VFI system was operated exactly as is expected in the tank

farm, with the following exceptions: power was provided from a building outlet and the VFI was horizontal. The testing described in this document verifies that the mechanical and electrical features are operating as designed and that the unit is ready for field service.

1252 (WHC-SD-WM-ATR-112) Acceptance test report for the Westinghouse 100 ton hydraulic trailer. Barrett, R.A. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008807. Source: OSTI; NTIS; INIS; GPO Dep.

The SY-101 Equipment Removal System 100 Ton Hydraulic Trailer was designed and built by KAMP Systems, Inc. Performance of the Acceptance Test Procedure at KAMP's facility in Ontario, California (termed Phase 1 in this report) was interrupted by discrepancies noted with the main hydraulic cylinder. The main cylinder was removed and sent to REMCO for repair while the trailer was sent to Lampson's facility in Pasco, Washington. The Acceptance Test Procedure was modified and performance resumed at Lampson (termed Phase 2 in this report) after receipt of the repaired cylinder. At the successful conclusion of Phase 2 testing the trailer was accepted as meeting all the performance criteria specified.

1253 (WHC-SD-WM-CGA-001) Video Graphic Recorder (VGR) calibration. Akers, J.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010137. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines a calibration procedure for the Video Graphic Recorder (VGR) on the Rotary Mode Core Sample Trucks (RMCST) three and four. Intent is to use this document to check/calibrate the VGR until a calibration procedure can be created by Tank Waste Remediation System personnel.

1254 (WHC-SD-WM-CM-008) Configuration management plan for waste tank farms and the 242-A evaporator of tank waste remediation system. Laney, T. Westinghouse Hanford Co., Richland, WA (United States). 30 Aug 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000504. Source: OSTI; NTIS; INIS; GPO Dep.

The configuration management architecture presented in this Configuration Management Plan is based on the functional model established by DOE-STD-1073-93, "Guide for Operational Configuration Management Program." The DOE Standard defines the configuration management program by the five basic program elements of "program management," "design requirements," "document control," "change control," and "assessments," and the two adjunct recovery programs of "design reconstitution," and "material condition and aging management." The CM model of five elements and two adjunct programs strengthen the necessary technical and administrative control to establish and maintain a consistent technical relationship among the requirements, physical configuration, and documentation. Although the DOE Standard was originally developed for the operational phase of nuclear facilities, this plan has the flexibility to be adapted and applied to all life-cycle phases of both nuclear and non-nuclear facilities. The configuration management criteria presented in this plan endorses the DOE Standard and has been tailored specifically to address the technical relationship of

requirements, physical configuration, and documentation during the full life cycle of the Waste Tank Farms and 242-A Evaporator of Tank Waste Remediation System.

1255 (WHC-SD-WM-CM-011) Hanford Site waste tank farm facilities design reconstitution program plan. Vollert, F.R. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019005. Source: OSTI; NTIS; INIS; GPO Dep.

Throughout the commercial nuclear industry the lack of design reconstitution programs prior to the mid 1980's has resulted in inadequate documentation to support operating facilities configuration changes or safety evaluations. As a result, many utilities have completed or have ongoing design reconstitution programs and have discovered that without sufficient pre-planning their program can be potentially very expensive and may result in end-products inconsistent with the facility needs or expectations. A design reconstitution program plan is developed here for the Hanford waste tank farms facility as a consequence of the DOE Standard on operational configuration management. This design reconstitution plan provides for the recovery or regeneration of design requirements and basis, the compilation of Design Information Summaries, and a methodology to disposition items open for regeneration that were discovered during the development of Design Information Summaries. Implementation of this plan will culminate in an end-product of about 30 Design Information Summary documents. These documents will be developed to identify tank farms facility design requirements and design bases and thereby capture the technical baselines of the facility. This plan identifies the methodology necessary to systematically recover documents that are sources of design input information, and to evaluate and disposition open items or regeneration items discovered during the development of the Design Information Summaries or during the verification and validation processes. These development activities will be governed and implemented by three procedures and a guide that are to be developed as an outgrowth of this plan.

1256 (WHC-SD-WM-CMD-001) Closed out Tank 241-SY-101 DACS system change request #1-100. Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 167p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008885. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a compilation of system change requests processed during the development of the Data Acquisition and Control System for the Tank 241-SY-101 hydrogen mitigation project. Tank 241-SY-101 is on the Hydrogen Watch List. The disposition of the request, date the change was installed, date verified, and whether an Acceptance Test Procedure was required and completed are described for each request change.

1257 (WHC-SD-WM-CMD-002) Closed out tank 241-SY-101 DACS system change requests No. 101-200. Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008838. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a record closed out System Change Request No. 101-200 used during the development

of the 241-SY-101 Hydrogen Mitigation Project Data Acquisition Control System.

1258 (WHC-SD-WM-CMD-003) Closed out tank 241-SY-101 DACS system change requests No. 201-300. Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 228p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008834. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a record of closed out System Change Requests No. 201-300 used during the development of the 241-SY-101 Hydrogen Mitigation Project Data Acquisition Control System.

1259 (WHC-SD-WM-CMD-004) Closed out tank 241-SY-101 DACS System Change Request No. 301-400. Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 14 Mar 1995. 205p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009105. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a record closed out System Change Request No. 301-400 used during the development of the 241-SY-101 Hydrogen Mitigation Project Data Acquisition Control System.

1260 (WHC-SD-WM-CR-057) Criteria for core sampling bit temperature monitor. Francis, P.M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001309. Source: OSTI; NTIS; INIS; GPO Dep.

A temperature monitoring device needs to be developed for the tank core sampling trucks. It will provide an additional indication of safe drill bit temperatures and give the operator a better feel for the effects of changing drill settings. This document defines the criteria for the bit monitoring system, including performance requirements, information on the core sampling system, and other conditions that may be encountered.

1261 (WHC-SD-WM-CSCM-027) System configuration management plan for 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System. Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002280. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Standard defines the configuration management program by the five basic program elements of "program management," "design requirements," "document control," "change control," and "assessments," and the two adjunct recovery programs of "design reconstitution," and "material condition and aging management. The C-M model of five elements and two adjunct programs strengthen the necessary technical and administrative control to establish and maintain a consistent technical relationship among the requirements, physical configuration, and documentation. Although the DOE Standard was originally developed for the operational phase of nuclear facilities, this plan has the flexibility to be adapted and applied to all life-cycle phases of both nuclear and non-nuclear facilities. The configuration management criteria presented in this plan endorses the DOE Standard and has been tailored specifically to address the technical relationship of requirements, physical configuration, and

documentation during the full life-cycle of the 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System.

1262 (WHC-SD-WM-CSDD-004) **The family of standard hydrogen monitoring system computer software design description: Revision 2.** Bender, R.M. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003780. Source: OSTI; NTIS; INIS; GPO Dep.

In March 1990, 23 waste tanks at the Hanford Nuclear Reservation were identified as having the potential for the buildup of gas to a flammable or explosive level. As a result of the potential for hydrogen gas buildup, a project was initiated to design a standard hydrogen monitoring system (SHMS) for use at any waste tank to analyze gas samples for hydrogen content. Since it was originally deployed three years ago, two variations of the original system have been developed: the SHMS-B and SHMS-C. All three are currently in operation at the tank farms and will be discussed in this document. To avoid confusion in this document, when a feature is common to all three of the SHMS variants, it will be referred to as "The family of SHMS." When it is specific to only one or two, they will be identified. The purpose of this computer software design document is to provide the following: the computer software requirements specification that documents the essential requirements of the computer software and its external interfaces; the computer software design description; the computer software user documentation for using and maintaining the computer software and any dedicated hardware; and the requirements for computer software design verification and validation.

1263 (WHC-SD-WM-CSDD-008-Rev.1) **Computer system design description for SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1).** Revision 1. Truitt, R.W. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos National Lab., NM (United States). 24 Aug 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ; W-7405-ENG-36. Order Number DE94018501. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides descriptions of components and tasks that are involved in the computer system for the data acquisition and control of the mitigation tests conducted on waste tank SY-101 at the Hanford Nuclear Reservation. The system was designed and implemented by Los Alamos National Laboratory and supplied to Westinghouse Hanford Company. The computers (both personal computers and specialized data-taking computers) and the software programs of the system will hereafter collectively be referred to as the DACS (Data Acquisition and Control System).

1264 (WHC-SD-WM-CSDD-014) **Computer system design description for the spare pump mini-dacs data acquisition and control system.** Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 283p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001592. Source: OSTI; NTIS; INIS; GPO Dep.

The attached document outlines the computer software design for the mini data acquisition and control system (DACS), that supports the testing of the spare pump for Tank 241-SY-101, at the maintenance and storage facility (MASF).

1265 (WHC-SD-WM-CSDD-015) **Void fraction system computer software design description.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 15 Feb 1995. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008044. Source: OSTI; NTIS; GPO Dep.

This document describes the software that controls the void fraction instrument. The format of the document may differ from typical Software Design Reports because it was created with a graphical programming language. Hardware is described in Section 2. The purpose of this document is describe the software, so the hardware description is brief. Software is described in Section 3. LabVIEW was used to develop the viscometer software, so Section 3 begins with an introduction to LabVIEW. This is followed by a description of the main program. Finally each Westinghouse developed subVI (sub program) is discussed.

1266 (WHC-SD-WM-CSRS-016) **Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1).** McNeece, S.G.; Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002146. Source: OSTI; NTIS; INIS; GPO Dep.

The system requirements specification for SY-101 hydrogen mitigation test project (HMTF) data acquisition and control system (DACS-1) documents the system requirements for the DACS-1 project. The purpose of the DACS is to provide data acquisition and control capabilities for the hydrogen mitigation testing of Tank SY-101. Mitigation testing uses a pump immersed in the waste, directed at varying angles and operated at different speeds and time durations. Tank and supporting instrumentation is brought into the DACS to monitor the status of the tank and to provide information on the effectiveness of the mitigation test. Instrumentation is also provided for closed loop control of the pump operation. DACS is also capable for being expanded to control and monitor other mitigation testing. The intended audience for the computer system requirements specification includes the SY-101 hydrogen mitigation test data acquisition and control system designers: analysts, programmers, instrument engineers, operators, maintainers. It is intended for the data users: tank farm operations, mitigation test engineers, the Test Review Group (TRG), data management support staff, data analysis, Hanford data stewards, and external reviewers.

1267 (WHC-SD-WM-CSWD-067) **System verification and validation plan for SY-101 Hydrogen Mitigation Test Project Data Acquisition and Control System (DACS-1).** McNeece, S.G.; Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003639. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the system verification and validation plan for the SY-101 DACS, covering the operation and maintenance phase of the project life cycle.

1268 (WHC-SD-WM-CSWD-069) **Certification of version 1.2 of the PORFLO-3 code for the WHC scientific and engineering computational center.** Kline, N.W. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 32p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. Order Number DE95005596. Source: OSTI; NTIS; INIS; GPO Dep.

Version 1.2 of the PORFLO-3 Code has migrated from the Hanford Cray computer to workstations in the WHC Scientific and Engineering Computational Center. The workstation-based configuration and acceptance testing are inherited from the CRAY-based configuration. The purpose of this report is to document differences in the new configuration as compared to the parent Cray configuration, and summarize some of the acceptance test results which have shown that the migrated code is functioning correctly in the new environment.

1269 (WHC-SD-WM-CSWL-002-Rev.2) Material balance software for 242A Evaporator and tank farms. Revision 2. Persin, R.M. Westinghouse Hanford Co., Richland, WA (United States). 11 Apr 1995. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010597. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the Material Balance Software System used by the operator to calculate a Material Balance during the operation of the 242A Evaporator and the transfer of material between primary tanks supporting the evaporation process. It describes intent and design of each program used within the software system and gives details into the algorithms and methods used to create each program. This document also presents program source file listings, data file formats and printed output format.

1270 (WHC-SD-WM-DA-144) Wind and seismic analysis for liquid-level gauge support. Ziada, A.H. Westinghouse Hanford Co., Richland, WA (United States). 7 Dec 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004752. Source: OSTI; NTIS; INIS; GPO Dep.

A wind and seismic analysis was performed for the liquid-level gauge installation support stand. The analysis includes the stand and footing only. All of these supports are classified as safety class 3. The analysis was based on safety class 2 requirements for conservatism. Conventional hand calculations were performed to evaluate the stresses and overturning of the structure. The results and recommendations appear in Section 2.0. The configuration and loadings are discussed in Section 3.0; the analysis and evaluation appears in Section 4.0; and the detailed analysis is documented in Appendix A.

1271 (WHC-SD-WM-DA-157) Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump. Jones, K.M. Westinghouse Hanford Co., Richland, WA (United States). 9 Sep 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003052. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the structural analysis of the flexible-receiver yoke brace that will be used to maintain the mixer pump lifting yoke in a vertical position during the removal of the mixer pump from waste tank 241SY101. During the removal process, the crane is connected to a lifting yoke which is attached to the lifting on the mounting flange of the mixer pump. The pump then can be lifted from the tank. At one point in the removal procedure, the crane will be disconnected from the lifting yoke. At this time, it is possible for the lifting yoke to rotate around the pinned connection between it and the pump if it is subjected to a horizontal load. To prevent the rotation of the lifting yoke, the yoke brace

was designed to maintain the yoke in a vertical position while it is disconnected from the crane. This analysis addressed the adequacy of the yoke brace to provide support for the lifting yoke during high winds and a seismic event. The results of this analysis show that, when subjected to a combined design wind and seismic load, the yoke brace design is acceptable to maintain the lifting yoke in a vertical position when the yoke is disconnected from the crane.

1272 (WHC-SD-WM-DA-158) Strong-back safety latch. DeSantis, G.N. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008892. Source: OSTI; NTIS; INIS; GPO Dep.

The calculation decides the integrity of the safety latch that will hold the strong-back to the pump during lifting. The safety latch will be welded to the strong-back and will latch to a 1.5-in. dia cantilever rod welded to the pump baseplate. The static and dynamic analysis shows that the safety latch will hold the strong-back to the pump if the friction clamps fail and the pump become free from the strong-back. Thus, the safety latch will meet the requirements of the Lifting and Rigging Manual for under the hook lifting for static loading; it can withstand shock loads from the strong-back falling 0.25 inch.

1273 (WHC-SD-WM-DA-159) National standard and code compliance for electrical equipment installed in hazardous locations for the void fraction instrument. Bussell, J.H.; Martin, J.D.; Stokes, T.I. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002158. Source: OSTI; NTIS; INIS; GPO Dep.

The hazardous area classification is evaluated and defined for the void fraction instrument (VFI). The void fraction instrument is an instrument that is used to measure gas bubble concentration in tank waste. It is a 18.3 meter (60-foot) long pipe with swivel sampling head. The assembly is lowered into tank waste via an available riser and waste sample is obtained. The sample is obtained and the sample chamber is pressurized from a fixed volume chamber. The pressure is then measured and then the VFI is moved to the next sample elevation.

1274 (WHC-SD-WM-DA-160) Analysis of the flexible receiver lifting yoke and blast shield assembly. Tank 241SY101. Huang, F.H. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008477. Source: OSTI; NTIS; INIS; GPO Dep.

The analysis of the lifting yoke and blast shield assembly considers the bending stress, weld strength, and resistance of the lug hole to tear out. The bending stress of the lifting lugs is evaluated to ensure that they meet the requirements of the American Institute for Steel Construction (AISC 1989). Also considered in the calculations is the capability of the thick lugs to withstand the weight of the pump together with that of the container and strongback during rotation to the horizontal position.

1275 (WHC-SD-WM-DA-161) Structural analysis of multiport riser 5A installation on tank 241SY101. Strehlow, J.P. Westinghouse Hanford Co., Richland, WA (United States). 16 Sep 1994. 380p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001044. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank 101-SY multiport riser assembly in the 241-SY-101 waste tank will replace the existing 42 inch riser with four smaller ports. Each smaller port can be used independently to access the tank interior with equipment and instruments needed to mitigate the concentration of hydrogen in the tank. This document provides a design report on the structural evaluation of the multiport riser assembly as well as its anchorage. The multiport riser assembly is a steel structure installed directly above the 42-inch riser and sealed at the existing riser flange. The assembly is structurally supported by the concrete pad placed around the 42 inch riser. The multiport riser assembly will provide two 8-inch penetrations, one 12-inch penetration and one 24-inch penetration. Each penetration will have a shielding plate. These penetrations will be used to insert equipment such as a sonic probe into the tank. In addition to normal loads, non-reactor Safety Class 1 structures, systems and components are to withstand the effects of extreme environmental loads including Design Basis Earthquake (DBE), Design Basis Wind (DBW), Design Basis Flood, Volcanic Eruptions and other abnormal loads considered on a case by case basis. Non-reactor Safety Class 2, 3 and 4 structures, systems and components are those that are not Safety Class 1 and are respectively specified as onsite safety related, occupational safety related and non-safety related items. The 241-SY-101 tank is considered as a non-reactor Safety Class 1 structure. The multiport riser assembly is considered as a non-reactor Safety Class 2 structure since it serves to contain the radioactive and toxic materials under normal operating conditions. However, the pressure relief doors provided on the assembly are considered as Safety Class 1 structures.

1276 (WHC-SD-WM-DA-162) Structural analysis of multiport flange installation of tanks 241AW101 and 241SY101. Volumes 1-3. Blume, J.A.; Strehlow, J.P. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 611p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018504. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides the structural analysis of record of the multiport flange that will be installed on tanks 241AW101 and 241SY101. This analysis includes both dead weight and seismic evaluations, and an evaluation of a postulated hydrogen burn event for tank 241SY101.

1277 (WHC-SD-WM-DA-164) Structural analysis of color video camera installation on Tank 241SY101 (2 volumes). Blume, J.A.; Strehlow, J.P. Westinghouse Hanford Co., Richland, WA (United States). 18 Aug 1994. 315p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003072. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides the structural analysis of record for the color video camera assembly that will be installed in tank 241SY101. This analysis includes both deadweight and seismic evaluations. The camera assembly is a purchased item, see CVI File 22580 for information on the camera.

1278 (WHC-SD-WM-DA-165) Structural analysis of the equipment removal system for tank 241SY101. Mackey, T.C. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 157p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008464. Source: OSTI; NTIS; INIS; GPO Dep.

The calculations documented in this report show that the ERS major components are structurally qualified to complete the objective, i.e., to install the removed equipment into a shipping container and transport and store the container at the Central Waste Complex (CWC). The analysis for the structural members of the ERS components considers live load with an impact factor of 125 % added to dead load. An allowable stress of one-third yield is used for all structural components carrying the load based on DOE-RL-92-36. Adherence to DOE-RL-92-36 is not a code requirement. However, the loads considered make this factor of safety appropriate. The calculations meet the strength requirements of the American Institute for Steel Construction (AISC 1989) for all non-critical structural elements.

1279 (WHC-SD-WM-DA-166) Analysis of BY-106 pump pit cover plate. Coverdell, B.L. Westinghouse Hanford Co., Richland, WA (United States). 14 Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003856. Source: OSTI; NTIS; INIS; GPO Dep.

A new cover for the pump pit of Tank 241-BY-106 has been designed to allow the rotary core exhaustor to be hooked up without requiring pit entry, riser modification, or equipment removal. The new pit cover is necessary to allow installation of two risers for reducing exposure, contamination, and waste. Computer analysis indicates that the safety margin of the pit cover plate with two risers is adequate. The computer stress model and input files are attached. The pit cover plate is a replacement for an existing plate; therefore seismic and wind loads were considered for the plate only.

1280 (WHC-SD-WM-DA-167) Cradle modification for hydraulic ram. Koons, B.M. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008462. Source: OSTI; NTIS; INIS; GPO Dep.

The analysis of the cradle hydraulic system considers stress, weld strength, and hydraulic forces required to lift and support the cradle/pump assembly. The stress and weld strength of the cradle modifications is evaluated to ensure that they meet the requirements of the American Institute for Steel Construction (AISC 1989). The hydraulic forces are evaluated to ensure that the hydraulic system is capable of rotating the cradle and pump assembly to the vertical position (between 70° and 90°).

1281 (WHC-SD-WM-DA-168) Miscellaneous component design for Tank 241SY101 pump removal. Huang, F.H. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008425. Source: OSTI; NTIS; INIS; GPO Dep.

A mixer pump has been used to mitigate the hydrogen build-up in tank 241SY101 (SY101), located in the 200 West Area of the Hanford Site. New equipment is being prepared for the removal, transport, storage, and disposal of the test pump. The disposal equipment for the test pump now in tank SY101 includes a shipping container, a strong back, a lifting beam, a test weight, container support stands, a modified mock-up pump, a flexible receiver blast shield, a lifting

yoke, and a yoke brace. The structural evaluations of container and strong back are detailed in another supporting document (WHC 1994a), the engineering analyses of flexible receiver blast shield/lifting yoke and yoke brace are given in other supporting documents (WHC 1994b, WHC 1994c), respectively. Engineering tasks that were contracted to Advanced Engineering Consultants (AEC) include the design and analysis of the following. Two spreader-beam lifting devices, a Container test weight, Container support saddles. Mock-up pump modification. This report documents the work description, design basis, assumptions, and design calculations provided by AEC for the above components. All AEC documents appear in Appendix A. Additional work conducted by Westinghouse Hanford Company (WHC) on the modified container test weight, modification to the mock-up pump, the removable support for the transport assembly, and saddle modification for air pallets also are included in this document.

1282 (WHC-SD-WM-DA-169) Design analysis supporting 101-SY Riser 3A Spraywand Adapter and Lifting Yoke Design. Shaw, S.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000983. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the results of stress and radiological analysis performed in support of the Riser 3A Spraywand Adapter and Lifting Yoke.

1283 (WHC-SD-WM-DA-170) Bolting sequence for attaching the container to the strong-back for 241SY101. Mackey, T.C.; Egger, J.V. Westinghouse Savannah River Co., Aiken, SC (United States). 5 Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001634. Source: OSTI; NTIS; INIS; GPO Dep.

This bolting sequence is for attaching the container to the strong-back for Tank 241-SY-101. This supporting document includes information for the proper bolting sequence for attaching the container to the strong-back is found in supporting document WHC-SD-WM-DA-165 (WHC 1994a) and is in accordance with Standard Arch-Civil Design Criteria, Design Loads for Facilities (SDC 4.1) Safety Class 3.

1284 (WHC-SD-WM-DA-173) SY farm fence relocation. Desantis, G.N. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003084. Source: OSTI; NTIS; INIS; GPO Dep.

This design analysis provides structural calculation for determining the bending and shearing of existing monolithic blocks, which will be used as a bridge over a 3 inch stream line at 241-SY farm. This bridge is to be used only on a temporary base to allow two cement trucks (not exceeding a 64,000 pound total load) into the farms.

1285 (WHC-SD-WM-DA-179) Analysis of lifting beam and redesigned lifting lugs for 241-AZ-01A decant pump. Coverdell, B.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Nov 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005433. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document details calculations for the proper design of a lifting beam and redesigned lifting lugs

for the 241AZ01A decant pump. This design is in accordance with Standard Architectural-Civil Design Criteria, Design Loads for Facilities (DOE-RL 1989) and is safety class three. The design and fabrication is in accordance with American Institute of Steel Construction, Manual of Steel Construction, (AISC, 1989) and the Hanford Hoisting and Rigging Manual (DOE-RL 1993).

1286 (WHC-SD-WM-DA-183) Compressed air piping, 241-SY-101 hydraulic pump retrieval trailer. Wilson, T.R. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005097. Source: OSTI; NTIS; INIS; GPO Dep.

The following Design Analysis was prepared by the Westinghouse Hanford Company to determine pressure losses in the compressed air piping installed on the hydraulic trailer for the 241-SY-101 pump retrieval mission.

1287 (WHC-SD-WM-DA-187) Evaluation of the effects on concrete pits due to long-length contaminated equipment platforms. Rodgers, L.A. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 351p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011550. Source: OSTI; NTIS; INIS; GPO Dep.

A seismic evaluation of concrete pits was performed for loads induced by long-length contaminated equipment platform. This evaluation has two load scenarios included in the analyses. The first scenario is the combined static and seismic soil and wall seismic loads applied to the pit walls. The second scenario is the LLCE platform seismic loads applied to the pit walls. All 40 pits have a positive margin of safety for the second load scenario which is the LLCE platform seismic effects. However, in the first load scenario there are seven pits that exceed the ACI 349 load limits when subjected to the combined static and seismic soil, and concrete inertial loads while the cover blocks are removed.

1288 (WHC-SD-WM-DB-024) Design basis and requirements for 241-SY Modular Exhauster concrete pad and retaining wall. Kriskovich, J.R. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003083. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to serve as the design and functional requirements for a concrete pad for the new 241-SY Modular Exhauster and for a retaining wall to be built near the new ventilation systems.

1289 (WHC-SD-WM-DB-025) Design basis and requirements for 241-SY modular exhauster mechanical installation. Kriskovich, J.R. Westinghouse Hanford Co., Richland, WA (United States). 10 Nov 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003849. Source: OSTI; NTIS; INIS; GPO Dep.

A new ventilation system is being installed to serve as the K-1 primary exhauster. The existing K-1 primary exhauster will then become the backup. This ventilation system services waste tanks 241-SY-101, 102 and 103. The nominal flow rate through the ventilation system is 1,000 cfm. The new ventilation system will contain a moisture eliminator, a heater, a prefilter, two stages of HEPA filtration, an exhaust fan, a stack and stack sampling system. The purpose of this document is to serve as the design and functional requirements for the mechanical installation of the new 241-SY

modular exhauster. The mechanical installation will include modifying the existing ductwork (i.e., installing a "T" to connect the new exhauster to the existing system), modifying the existing condensate drain lines to accommodate the new lines associated with the new exhauster, a maintenance platform near the stack of the new exhauster, guy wires and guy wire footings to support the stack of the new exhauster, as well as other miscellaneous tasks associated with the mechanical installation design effort.

1290 (WHC-SD-WM-DB-026) T-Farm complex alarm upgrades. Roberts, J.B. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 280p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005431. Source: OSTI; NTIS; GPO Dep.

The alarm and controls associated with the T, TX, and TY farms are located in the 242-T control room. The design data for replacement and upgrades of the alarm panels is in this document. This task was canceled previous to the 90% design review point.

1291 (WHC-SD-WM-DGS-001) Radiological containment selection, design, and specification guide. Brown, R.L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002093. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance to Tank Waste Remediation Systems personnel in determining what containment is appropriate for work activities, what containments are available, general applications of each, design criteria, and other information needed to make informed decisions concerning containment application.

1292 (WHC-SD-WM-DLP-006) Thermal conductivity analytical development. Bechtold, D.B. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011549. Source: OSTI; NTIS; INIS; GPO Dep.

In order to meet Data Quality Objectives for Tank Waste Characterization, a method for measuring thermal conductivity of waste tank sludges and other non-convectable samples in the laboratory or the field has been developed utilizing recent commercially available technology. The method is based on an innovative commercial application of the transient heated line source. Local adaptations permit a measuring range of 0.024 to 12 Watt/meter/Kelvin on required sample volumes between 100 and 620 mL. The method has been tested on a variety of solids and on two synthetic sludges, and has also been tested for NIST traceability against two standards. Achievable accuracy is better than 15% uncorrected, or better than 10% corrected to NIST traceability. The method is nondestructive. Completion of this technology development task also completes commitment number 5.4 in response to the DNFSB report 93-05.

1293 (WHC-SD-WM-DP-065) Analysis and characterization of double shell tank 241-AP-108. Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 1444p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005169. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the first part of a three-part report describing the analysis and characterization of double shell tank 241-AP-108 which is located at the Hanford Reservation. This document is the analytical laboratory data package

entitled 'Analysis and Characterization of Double Shell Tank 241-AP-108' which contains a case sampling history, the sampling protocols, the analytical procedures, sampling and analysis quality assurance and quality control measures, and chemical analysis results for samples obtained from the tank.

1294 (WHC-SD-WM-DP-065-Add.1A) Analyses and characterization of double shell tank. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 289p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007650. Source: OSTI; NTIS; INIS; GPO Dep.

Evaporator candidate feed from tank 241-AP-108 (108-AP) was sampled under prescribed protocol. Physical, inorganic, and radiochemical analyses were performed on tank 108-AP. Characterization of evaporator feed tank waste is needed primarily for an evaluation of its suitability to be safely processed through the evaporator. Such analyses should provide sufficient information regarding the waste composition to confidently determine whether constituent concentrations are within not only safe operating limits, but should also be relevant to functional limits for operation of the evaporator. Characterization of tank constituent concentrations should provide data which enable a prediction of where the types and amounts of environmentally hazardous waste are likely to occur in the evaporator product streams.

1295 (WHC-SD-WM-DP-067) Analyses and Characterization of 242-A Evaporator Slurry, Campaign 94-1. Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 4545p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Source: OSTI.

During the 242-A Evaporator's 94-1 campaign, five process samples were collected from the slurry stream for waste characterization. The five samples were collected over a 36 day time span, respectively on May 4, May 9, May 16, May 23, and June 9, 1994. Sample collections were performed per the protocol described in 242-A Evaporator Waste Analysis, Plan, WHC-SD-WM- EV-060, Rev. 3 and in 242-A Evaporator Quality Assurance Project Plan, WHC-SD-WM-QAPP-009, Rev. 0. Slurry waste was characterized chemically and radiochemically by the Westinghouse Hanford Company, 222-S Laboratory as directed by four documents.

1296 (WHC-SD-WM-DP-069) Single shell tank waste characterization for Tank 241-BX-101. Kocher, K.L. Westinghouse Hanford Co., Richland, WA (United States). 10 Aug 1994. 177p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000515. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the characterization information and interprets the data for Double-Shell Tank AP-102.

1297 (WHC-SD-WM-DP-071) 95-1 Campaign evaporator bolldown results. Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002115. Source: OSTI; NTIS; INIS; GPO Dep.

The Process Chemistry Laboratories were requested to support the 242-A Evaporator restart as part of the overall 222-S laboratory effort. The net purpose of these studies is to determine the characteristics of double-shell tank materials as they are processed in the evaporator. The results for

the boil-down study (which includes pressure and temperature versus % waste volume reduction and density of final boil-down residue) supporting the 242-A Evaporator restart are reported below. The boil-down was performed in a vacuum distillation apparatus with an adjustable vacuum limiting manometer and an isolatable collection graduated cylinder. The boil-down was conducted over a seven hour period. The evaporation was done at 60 torr (to avoid excessive foaming and bumping of solution) for approximately half of the boil-down, the pressure then being reduced to 40 torr when the reduction in solution volume allowed this to be done. Percent waste volume reduction was measured by observing the amount of condensate collected in a graduated cylinder. As the graduated cylinder became full, it was isolated from the rest of the system and the condensate removed. Pressure was set using an electronic manometer with a low pressure limiter set at the desired level. Temperature was measured using a J-type thermocouple. The apparatus was calibrated by observing the pressure versus temperature response of pure water, and comparing the values thus obtained to published values.

1298 (WHC-SD-WM-DP-072) Single shell tank waste characterization for Tank 241-BX-108. Kocher, K.L. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010584. Source: OSTI; NTIS; INIS; GPO Dep.

The BX-108 sample from riser 6 was removed from the tank on 7/14/94 at 1130 hours. The dose rate through the drill was string 30 mR/hr. Shipment to the 222-S Laboratories took place on 7/15/94 at 1220 hours. The auger was loaded into the Hot Cell on 7/26/94 and extruded. The sample contained no drainable liquid or liner liquid and a total of 34.28 grams of materials was recovered. A video photograph showed a small amount of sample material was visible on all 8 flutes of the auger. It was noted that sample drying occurred prior to subsampling. The entire sample appeared completely dry and brittle during subsampling. Even the clay-like material appeared to lose a significant amount of its moisture. The sample from BX-108 riser 6 was in no way similar to sample from BX-108 riser 2. Analytical results showed that the % moisture result was below the safety criteria limit of < 17%. This report documents results from the TGA, DSC, and Alpha total analyses.

1299 (WHC-SD-WM-DP-073) Tank 241-SY-103 auger samples, risers 7A, 14B and 22A. Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 208p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005988. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary differential scanning calorimetry (DSC) and thermal gravimetric analysis (TGA) data were reported in a letter from K.L. Kocher, WHC, to G.D. Johnson; et. al, WHC, "40 Day Deliverable for Tank 241-SY-103", dated July 14, 1994. This report is the final report for the Sy-1-3 auger sample characterization effort; some of the data reported earlier may have changed. A copy of the hot cell work plan, chain of custody forms, extruded segment description sheets, and photographs of the extruded augers were also included in the cited letter. The final DSC, TGA, total organic carbon (TOC), and total inorganic carbon (TIC) data, and the DSC and TGA scans and analytical cards, are reported here.

1300 (WHC-SD-WM-DP-0076) 45-Day deliverable for Tank 241-BX-105 Auger samples, risers 2 and 6. Bell,

K.E. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003999. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from single-shell tank 241-BX-105 (BX-105) were extruded, broken down, and analyzed for DSC, TGA, and total alpha as prescribed. Analytical results were tracked and reported using the laboratory information management system known as LabCore. This is the final report for the fiscal year 1995 BX-105 auger sample characterization effort. Included are copies of the differential scanning calorimetry (DSC) and thermogravimetric analyses (TGA) scans as requested. Also included is a copy of any immediate notification documentation, chain of custody forms, the hot cell work plan, extruded segment [auger] description sheets, and total alpha data.

1301 (WHC-SD-WM-DP-077) 45-Day safety screening for Tank 241-B-102 auger samples, riser 1. Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 1 Dec 1994. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004371. Source: OSTI; NTIS; INIS; GPO Dep.

This is the 45-Day report for the fiscal year 1994 Tank 241-B-102 auger sampling characterization effort. Only one of the two planned auger samples was received by the 222-S Laboratory, however it was decided to begin the 45-day clock and issue a report based on receipt of the first auger sample. Included are copies of the differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) scans as requested. Also included is a copy of any immediate notification documentation, chain of custody forms, the hot cell work plan, extruded segment [auger] description sheets, and total alpha data. The TGA percent moisture results are below the safety criteria limit of 17% in a subsample taken approximately five minutes after extrusion and a second subsample taken from the lower half of the auger. Verbal and written notifications were made as prescribed. The DSC analysis of all subsamples indicates the presence of fraction exotherms, however the results are a factor of two or more below the notification limit of 523 Joules/gram (J/g). Total alpha results are all below the detection limit. In some cases, the tank characterization plan (TCP) accuracy and precision criteria are not met. If a re-run was not performed when a TCP quality control limit was not met, then reasons for not performing the re-run are provided.

1302 (WHC-SD-WM-DP-078) 45-Day safety screen results for single shell tank 241-AP-106, liquid grab samples, riser 1, 30° and 150° in conjunction with evaporator campaign 95-1. Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005648. Source: OSTI; NTIS; INIS; GPO Dep.

This is the 45-Day report for the fiscal year 1995 safety screening characterization of three liquid grab samples from single shell tank 241-AP-106. The required analyses are differential scanning calorimetry (DSC), thermal gravimetric analysis (TGA) and appearance (APPR). No analytes exceeded the notification limits, therefore, secondary analyses (RSST, cyanide, and hot persulfate-total organic carbon) were not required. Summary data tables 2, 3 and 4 present the appearance, DSC and TGA data, respectively. Total alpha analyses are not included in this report, because it is not required for liquid grab samples.

1303 (WHC-SD-WM-DP-079) **216-Day report for Tank 241-C-111, cores 58 and 59.** Rice, A.D. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005412. Source: OSTI; NTIS; INIS; GPO Dep.

Three core samples from tank C-111, and a field blank, were received by the 222-S laboratories. Cores 58, 59, and the field blank were analyzed in accordance with plans. A hot cell blank was analyzed at the direction of the hot cell chemist. No sample results exceeded the notification limits. Core 60 was not analyzed.

1304 (WHC-SD-WM-DP-080) **45-Day safety screening for Tank 241-C-103 push mode sample, riser 2.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005057. Source: OSTI; NTIS; INIS; GPO Dep.

This is the 45-Day report for the Tank 241-C-103 (C-103) push-mode core sampling characterization effort. Problems encountered with the push-mode sampling truck following removal of the first segment from riser 2 resulted in a long delay before resumption of sampling, therefore it was decided to begin the 45-day clock and issue a report based on receipt of this first segment. If subsequent segments are removed from tank C-103, a revision of this report or a new report will be issued to include any new data. Included are copies of the differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) scans as requested in Reference 1. Also included is a copy of any immediate notification documentation. Other pertinent documentation will be included in the C-103 216-day report.

1305 (WHC-SD-WM-DP-081) **Aqueous samples from B-Plant, Tank 9-1.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005932. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the final report for the B-Plant Tank 9-1 sampling and analysis program. This report is divided into three parts: first, a narrative about the history, sampling effort, quality control, sample tracking/laboratory identification, and a summary of the analysis; second, sampling and custody data; and lastly, a set of compiled data from the laboratory analysis.

1306 (WHC-SD-WM-DP-082) **45 Day safety screen results for Tank 241-C-108 - Augers 94-012, 94-014 and 94-015.** Rice, A.D. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006789. Source: OSTI; NTIS; INIS; GPO Dep.

Three auger samples from Tank C-108 (on the Ferrocyanide Watch List) were received by the 222-S laboratories. These samples underwent safety screening analysis (DSC, TGA, and Alpha Total) in accordance with reference below. No results exceeded the notification criteria. Due to the calculated depth of sludge at riser 7, two augers were used to sample the sludge. The first (94-AUG-012) was a ten inch auger, the second (94-AUG-014) was a 20 inch auger. One 20 inch auger (94-AUG-015) was used to sample the tank C-108 contents at riser 4. Results are compiled in this report.

1307 (WHC-SD-WM-DP-088) **Results from annual testing of ARECO cesium capsules from 1990-1994.** Lundeen, J.E. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000993. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to compile the results of the cesium capsule inspections and testing at the Applied Radiant Energy Corporation (ARECO) facility in Lynchburg, VA, performed in 1990, 1991, 1992, 1993, and 1994. The 25 cesium capsules at the ARECO facility were visually identified and clunk tested. A Go/No Go gauge test was required for capsules failing the clunk test. A visual inspection of capsules was required for the initial testing (1990). All 25 capsules passed the inspections and testing each year.

1308 (WHC-SD-WM-DP-089) **Data management plan for the ultrasonic inspection of the double-shell tanks.** Harris, J. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001542. Source: OSTI; NTIS; INIS; GPO Dep.

To obtain an operating permit from Washington State Department of Ecology, Westinghouse Hanford Company (WHC) must assess the double-shell tanks (DST) for structural integrity. The assessment includes volumetric examinations of the primary steel tank and secondary steel liner. The integrity of the tanks will be assessed by remote ultrasonic (UT) inspections of the primary and secondary steel tanks to measure wall thickness and detect corrosion pitting and stress corrosion cracking. The surfaces of the areas to be inspected will be cleaned with a power wire brush to remove loose mill scale, rust, and other materials that could inhibit proper coupling of the UT probe. To ensure that the cleaning process is satisfactory, the cleaned area will be viewed with a video camera and recorded. The video and UT equipment will be calibrated to ensure accuracy, and a performance test will be conducted to verify its capabilities. The tank inspection sequence consists of cleaning, visual examination, and UT inspection of each region selected for inspection: the primary tank wall, the tank bottom and lower knuckle, and the secondary tank wall. A significant amount of data will be collected and reported during these examinations. This data management plan (DMP) describes the data produced by the examinations and how and where the data are to be stored.

1309 (WHC-SD-WM-DP-096) **Concrete sample point: 304 Concretion Facility.** Rollison, M.D. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1995. 462p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009158. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains information concerning the analysis of concretes for volatile organic compounds. Included are the raw data for these analysis and the quality control data, the standards data, and all of the accompanying chains-of-custody records and requests for special analysis.

1310 (WHC-SD-WM-DP-097) **Tank characterization 40-day crust burn for double shell Tank 241-AW-101.** Esch, R.A. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009140. Source: OSTI; NTIS; INIS; GPO Dep.

Three auger samples from Tank AW-101 were received by the 222-S laboratories. They were analyzed to support the crust burn safety issue. No sample results exceeded the notification criteria.

1311 (WHC-SD-WM-DP-098) 45-Day safety screening report for grab samples from Tank 241-AP-107. Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009147. Source: OSTI; NTIS; INIS; GPO Dep.

Three samples; 107-AP-1C, 107-AP-2c and 107-AP-3C; were received at 222-S Laboratory for analysis of DSC, TGA and visual appearance. Four additional samples; 107-AP-1D, 107-AP-2D, 107-AP-3D and 107-AP-6; were received for visual appearance only. No results exceeded the safety screen notification criteria. This report compiles the analytical results. Tank 241-AP-107 is a double-shell tank which is not on any of the four Watch Lists.

1312 (WHC-SD-WM-DP-099) 45-Day safety screen results for Tank 241-C-103, Cores 63 and 66. Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010043. Source: OSTI; NTIS; INIS; GPO Dep.

Two core samples from tank C-103, obtained by the push-mode core sampling method, were received, extruded, and analyzed by the 222-S Laboratories in accordance with References 2 (core 63) or 3 (core 66). Drainable liquids were analyzed at the segment level for a separable organic layer, energetics by DSC, and percent water by TGA. Sludge samples were analyzed at the half-segment level by DSC, TGA, and for total alpha. Notification limits were exceeded for the following: (1) presence of a separable organic layer in the drainable liquid of segment 1, cores 63 and 64, and segment 2 of core 63; (2) DSC exotherm greater than 481 J/g on the lower half of segment 3 and drainable liquid of segment 4 of core 63; and (3) percent water less than 17% on the upper half of segment 4 of core 63.

1313 (WHC-SD-WM-DP-100) 45-Day safety screen results for Tank 241-AX-102, augers 95-AUG-006 and 95-AUG-007. Rice, A.D. Westinghouse Hanford Co., Richland, WA (United States). 17 Apr 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010596. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from Tank AX-102 were received by the 222-S laboratories. These samples underwent safety screening analysis (DSC, TGA, and Alpha total). The DSC results for both auger samples (S95T000203 and S95T000206) exceeded the notification criteria of 481 joules/g (dry). Notification was made on 3/23/95, as required. This report compiles analytical results. Tank AX-102 is not on any of the four Watch Lists.

1314 (WHC-SD-WM-DP-101) 45-Day Safety Screen results for Tank 241-TY-104, Auger Samples, 95-AUG-008 and 95-AUG-009. Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010193. Source: OSTI; NTIS; INIS; GPO Dep.

The two auger samples were collected from single-shell tank 241-TY-104 on February 28, 1995, and were analyzed

by the 222-S Laboratory in accordance with the tank characterization plan. The results of the analysis (differential scanning calorimetry, thermogravimetry, total alpha radioactivity, and total organic carbon) indicate that no safety screening notification limits were exceeded.

1315 (WHC-SD-WM-DP-102) 45-Day safety screen results for Tank 241-TY-106, auger samples 95-AUG-010 and 95-AUG-011. Jo, J. Westinghouse Hanford Co., Richland, WA (United States). 17 Apr 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010592. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from Tank TY-106 were received at the 222-S Laboratories. These samples underwent safety screening analysis Differential Scanning Calorimetry (DSC), Thermogravimetric Analysis (TGA) and Alpha Total. The test results indicate that no safety screening notification limits were exceeded. This single-shell tank is not listed on any of the four Watch Lists.

1316 (WHC-SD-WM-DP-129) Backup information for data tables in the extensive separations alternative engineering data package. Jansen, G. Jr. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 565p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009690. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains results of Raytheon/BNFL calculations and other backup information to data tables contained in the Extensive Separations Alternative Engineering Data Package, WHC-SD-WM-EV-100. The Extensive Separations Alternative will be evaluated in the TWRS-Environmental Impact Statement.

1317 (WHC-SD-WM-DQO-007) Data requirements for the Ferrocyanide Safety Issue developed through the data quality objectives process. Meacham, J.E. (Westinghouse Hanford Company, Richland, WA (United States)); Cash, R.J.; Dukelow, G.T.; Babad, H.; Buck, J.W.; Anderson, C.M.; Pulsipher, B.A.; Toth, J.J.; Turner, P.J. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001230. Source: OSTI; NTIS; INIS; GPO Dep.

This document records the data quality objectives (DQO) process applied to the Ferrocyanide Safety Issue at the Hanford Site. Specifically, the major recommendations and findings from this Ferrocyanide DQO process are presented. The decision logic diagrams and decision error tolerances also are provided. The document includes the DQO sample-size formulas for determining specific tank sampling requirements, and many of the justifications for decision thresholds and decision error tolerances are briefly described. More detailed descriptions are presented in other Ferrocyanide Safety Program companion documents referenced in this report. This is a living document, and the assumptions contained within will be refined as more data from sampling and characterization become available.

1318 (WHC-SD-WM-DQO-011-Rev.1) Interim data quality objectives for waste pretreatment and vitrification: Revision 1. Kupfer, M.J.; Conner, J.M.; Kirkbride, R.A.; Mobley, J.R. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001570. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) is responsible for storing, processing, and immobilizing the Hanford Site tank wastes. Characterization information on the tank wastes is needed so that safety concerns can be addressed, and retrieval, pretreatment, and immobilization processes can be designed, permitted, and implemented. This document describes the near-term tank waste sampling and characterization needs of the Pretreatment, High-Level Waste (HLW) Disposal, and Low-Level Waste (LLW) Disposal Programs to support the TWRS disposal mission. The final DQO (Data Quality Objective) will define specific waste tanks to be sampled, sample timing requirements, an appropriate analytical scheme, and a list of required analytes. This interim DQO, however, focuses primarily on the required analytes since the tanks to be sampled in FY 1994 and early FY 1995 are being driven most heavily by other considerations, particularly safety. The major objective of this Interim DQO is to provide guidance for tank waste characterization requirements for samples taken before completion of the final DQO. The characterization data needs defined herein will support the final DQO to help perform the following: Support the TWRS technical strategy by identification of the chemical and physical composition of the waste in the tanks and Guide development efforts to define waste pretreatment processes, which will in turn define HLW and LLW feed to vitrification processes.

1319 (WHC-SD-WM-DQO-014) 242-A Evaporator/Liquid Effluent Retention Facility data quality objectives. Von Bargen, B.H. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 226p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001434. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of data quality objectives (DQO) is to determine the most cost effective methods of gathering the essential data necessary to make decisions to support successful operation of the facility. The essential data is defined by such information as sample amount, sample location, required analyses, and how sampling and analyses are performed. Successful operation is defined as meeting the campaign objectives while operating within established requirements. This DQO document addresses that portion of the system from 242-A Evaporator candidate feed tanks through discharge of process condensate to the Liquid Effluent Retention of Facility (LERF). Later revisions will incorporate and integrate the entire system, including the Effluent Treatment Facility (ETF).

1320 (WHC-SD-WM-DRR-047) Design review report for 101-SY spare mixer pump. Benegas, T.R. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003070. Source: OSTI; NTIS; INIS; GPO Dep.

Reports the conclusion of the final design review for the 101-SY spare mixer pump. Tank 241-SY-101 (101-SY) experienced large flammable gas releases in the past which exceeded the lower flammable level limit for hydrogen gas in a nitrous oxide gas environment. A test pump was installed on July 3rd, 1993 which successfully mitigated the gas release problem in the 101-SY tank. Due to the success of the test effort and the upgrade of the operation of the pump from a test to a safety function, a spare pump was determined to be necessary. The spare pump design was to be based on the original design of the test pump with some slight modifications.

1321 (WHC-SD-WM-DTP-033) Technology development in support of the TWRS Process Flowsheet. Slaathaug, E.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003074. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System is to dispose of Hanford's Single-Shell and Double-Shell Tank waste. The TWRS Process Flowsheet (WHC-SD-WM-TI-613 Rev. 0) was issued recently. The process described by the flowsheet is based on a large number of assumptions that require verification and further definition through process and technology development activities. This development plan identifies and prioritizes tasks that should be completed to strengthen the technical foundation for the flowsheet.

1322 (WHC-SD-WM-DTR-025) Analytical test results for archived core composite samples from tanks 241-TY-101 and 241-TY-103. Beck, M.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Jul 1993. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018459. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the analytical tests performed on archived core composite samples from a 1.085 sampling of the 241-TY-101 (101-TY) and 241-TY-103 (103-TY) single shell waste tanks. Both tanks are suspected of containing quantities of ferrocyanide compounds, as a result of process activities in the late 1950's. Although limited quantities of the composite samples remained, attempts were made to obtain as much analytical information as possible, especially regarding the chemical and thermal properties of the material.

1323 (WHC-SD-WM-DTR-034) 101-SY waste sample speed of sound/rheology testing for sonic probe program. Cannon, N.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Jul 1994. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018001. Source: OSTI; NTIS; INIS; GPO Dep.

One problem faced in the clean-up operation at Hanford is that a number of radioactive waste storage tanks are experiencing a periodic buildup and release of potentially explosive gases. The best known example is Tank 241-SY-101 (commonly referred to as 101-SY) in which hydrogen gas periodically built up within the waste to the point that increased buoyancy caused a roll-over event, in which the gas was suddenly released in potentially explosive concentrations (if an ignition source were present). The sonic probe concept is to generate acoustic vibrations in the 101-SY tank waste at nominally 100 Hz, with sufficient amplitude to cause the controlled release of hydrogen bubbles trapped in the waste. The sonic probe may provide a potentially cost-effective alternative to large mixer pumps now used for hydrogen mitigation purposes. Two important parameters needed to determine sonic probe effectiveness and design are the speed of sound and yield stress of the tank waste. Tests to determine these parameters in a 240 ml sample of 101-SY waste (obtained near the tank bottom) were performed, and the results are reported.

1324 (WHC-SD-WM-DTR-036) Clean Salt Integrated flowsheet. Lunsford, T.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95001375. Source: OSTI; NTIS; INIS; GPO Dep.

The Clean Salt Process (CSP) is a novel waste management scheme that removes sodium nitrate and aluminum nitrate nonahydrate as decontaminated (low specific activity) salts from Hanford's high-level waste (HLW). The full scale process will separate the bulk of the waste that exists as sodium salts from the small portion of the waste that is by definition radioactive and dangerous. This report presents initial conceptual CSP flowsheets and demonstrates the benefit of integrating the process into the Tank Waste Remediation Systems (TWRS) Reference Flowsheet. Total HLW and low-level (LLW) volumes are reported for two different CSP integration options and are compared to the TWRS Reference Flowsheet values. The results for a single glass option eliminating LLW disposal are also reported.

1325 (WHC-SD-WM-EE-004-Rev.1) Performance assessment of grouted double-shell tank waste disposal at Hanford. Revision 1. Shade, J.W., Kincaid, C.T. (Pacific Northwest Lab., Richland, WA (United States)); Whyatt, G.A.; Rhoads, K.; Westsik, J.H. Jr.; Freshley, M.D.; Blanchard, K.A.; Shade, J.W.; Piepho, M.G.; Voogd, J.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 1,201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008432. Source: OSTI; NTIS; INIS; GPO Dep.

This document assesses the performance of the Grout Disposal Facility after closure. The facility and disposal environment are modeled to predict the long-term impacts of the disposal action. The document concludes that the disposal system provides reasonable assurance that doses to the public will remain within the performance objectives. This document is required for DOC Order 5820.2A.

1326 (WHC-SD-WM-EL-003) Operational Safety Requirements and Operating Specification Documentation compliance instrumentation matrices: 200 East Area Tank Farms. Story, D.R. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 278p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008481. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains information about matrices compiled of instrumentation used to comply with the existing Operational Safety Requirements from Safety Analysis Reports and Operating, Specification Documentation requirements for 200 East Area Tank Farms. These matrices contain the primary instrumentation needed to comply with each OSR and/or OSD requirement as well as any backup instrumentation that may be used should the primary device be out of service. The referenced matrices are provided as attachments to this document.

1327 (WHC-SD-WM-EMP-032) Tritium emissions from 200 East Area Double-Shell Tanks. Bachand, D.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Nov 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004364. Source: OSTI; NTIS; INIS; GPO Dep.

This document evaluates the need for tritium sampling of the emissions from the 200 East Area Double Shell Tanks based on the requirements of "National Emission Standards for Hazardous Air Pollutants" (NESHAP). The NESHAP requirements are specified in 40 Code of Federal Regulation (CFR), Part 61, Subpart H; "National Emission Standards for

Emissions of Radionuclides Other than Radon from Department of Energy Facilities".

1328 (WHC-SD-WM-ER-029-Rev.20) Operational waste volume projection. Revision 20. Koreski, G.M.; Strode, J.N. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003056. Source: OSTI; NTIS; INIS; GPO Dep.

Waste receipts to the double-shell tank system are analyzed and wastes through the year 2015 are projected based on generation trends of the past 12 months. A computer simulation of site operations is performed, which results in projections of tank fill schedules, tank transfers, evaporator operations, tank retrieval, and aging waste tank usage. This projection incorporates current budget planning and the clean-up schedule of the Tri-Party Agreement. Assumptions were current as of July 1994.

1329 (WHC-SD-WM-ER-308) Supporting document for the historical tank content estimate for A Tank Farm. Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 743p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001898. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200-East Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to the SSTs in the A Tank Farm of the northeast quadrant of the 200 East Area. Nine appendices compile data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

1330 (WHC-SD-WM-ER-309) Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm. Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 440p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001980. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical in-depth characterization information gathered in AX-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate Report of the NE Quadrant and the Hanford 200 East Areas.

1331 (WHC-SD-WM-ER-310) Supporting document for the historical tank content estimate for B Tank Farm. Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 740p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001983. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200-East Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to the SSTs in the B Tank Farm of the northeast quadrant of the 200 East Area. Nine appendices compile data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

1332 (WHC-SD-WM-ER-311) Supporting document for the North East Quadrant Historical Tank Content Estimate Report for BX-Tank Farm. Brevick, C.H. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 816p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001900. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides historical in-depth characterization information gathered on BX-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate Report of the NE Quadrant and the Hanford 200 East Areas.

1333 (WHC-SD-WM-ER-312) Supporting document for the historical tank content estimate for BY Tank Farm. Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 992p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001901. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200-East Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents

that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to the SSTs in the BY Tank Farm of the northeast quadrant of the 200 East Area. Nine appendices contain data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

1334 (WHC-SD-WM-ER-313) Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm. Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 1254p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001982. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical in-depth characterization information gathered on C-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate Report of the NE Quadrant and the Hanford 200 East Areas.

1335 (WHC-SD-WM-ER-323) Supporting document for the historical tank content estimate for S tank farm. Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 1243p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001979. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200 West Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to all the SSTs in the S Tank Farm of the southwest quadrant of the 200 West Area. Nine appendices compile data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

1336 (WHC-SD-WM-ER-324) Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm. Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 1300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930.

Order Number DE95001899. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical characterization information gathered on SX-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate of the SW Quadrant at the Hanford 200 West Area.

1337 (WHC-SD-WM-ER-325) Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm. Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 1030p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002233. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical characterization information gathered on U-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate of the SW Quadrant at the Hanford 200 West Area.

1338 (WHC-SD-WM-ER-332) Evaporation analysis for Tank SX-104. Barrington, C.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004503. Source: OSTI; NTIS; INIS; GPO Dep.

Decreases in historical interstitial liquid level measurements in tank SX-104 were compared to predictions of a numerical model based upon diffusion of water through a porous crust. The analysis showed that observed level decreases could be explained by evaporation.

1339 (WHC-SD-WM-ER-343) TWRS LDUA utilization study report. Rieck, R.H. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018152. Source: OSTI; NTIS; INIS; GPO Dep.

Tank Waste Remediation Systems functional requirements were reviewed. The Light Duty Utility Arm capabilities were considered as a means to support completion of these functional requirements. The recommendation is made to continue to develop the LDUA, integrating TWRS functional needs into the design to better support completion of TWRS mission needs.

1340 (WHC-SD-WM-ER-347) Thermal analysis of tank 241-SY-101 to support structural assessment. Beaver, T.R. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002240. Source: OSTI; NTIS; GPO Dep.

This report documents a thermal model of tank 241-SY-101 and the surrounding soil column that was used to predict tank temperatures resulting from heating of the annulus ventilation air. Transient results from the model were input to a structural model of the tank for evaluation of the annulus heat-up event.

1341 (WHC-SD-WM-ER-349) Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 East Area. Brevick, C.H.; Gaddis, L.A.; Pickett, W.W. Westinghouse Hanford Co., Richland, WA (United States).

Jun 1994. 451p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004789. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Northeast Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground single-shell tanks of the Hanford 200 East area. This report summarizes historical information such as waste history, temperature, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance, along with the components of the data management effort, such as waste status and Transaction Record Summary, Tank Layering Model, Defined Waste Types, and Inventory Estimates to generate these tank content estimates are also given in this report.

1342 (WHC-SD-WM-ER-351) Historical tank content estimate for the northwest quadrant of the Hanford 200 West Area. Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. ICF Kaiser Hanford Co., Richland, WA (United States). Mar 1995. 357p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010037. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Northwest Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground single-shell tanks of the Hanford 200 West area. This report summarizes historical information such as waste history, temperature, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance, along with the components of the data management effort, such as waste status and Transaction Record Summary, Tank Layering Model, Defined Waste Types, and Inventory Estimates to generate these tank content estimates are also given in this report.

1343 (WHC-SD-WM-ER-352) Historical Tank Content Estimate for the Southwest Quadrant of the Hanford 200 West Area. Brevick, C.H.; Gaddis, L.A.; Pickett, W.W. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 319p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004790. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Southwest Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground single-shell tanks of the Hanford 200 West Area. This report summarizes historical information such as waste history, temperature, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation and methods used for tank waste surveillance, along with the components of the data management effort, such as waste status and Transaction Record Summary, Tank Layering Model, Defined Waste Types, and Inventory Estimates to generate these tank content estimates are also given in this report.

1344 (WHC-SD-WM-ER-358) Tank characterization for Double-Shell Tank 241-AP-102. DeLorenzo, D.S. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); DiCenso, A.T.; Amato, L.C.; Weyns-Rollosen, M.I.; Smith, D.J.; Simpson, B.C.; Welsh, T.L. Westinghouse

Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). Aug 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000530. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the characterization information and interprets the data for Double-Shell Tank AP-102.

1345 (WHC-SD-WM-ER-359) Tank characterization report for Double-Shell Tank 241-AP-103. DeLorenzo, D.S. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); DiCenso, A.T.; Amato, L.C.; Franklin, J.D.; Lambie, R.W.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000534. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the characterization information and interprets the data for Double-Shell Tank AP-103. The results of the analyses have been compared to the dangerous waste codes in the Washington Dangerous Waste Regulations (WAC 173-303). This assessment was conducted by comparing tank analyses against dangerous waste characteristics (D waste codes) and against state waste codes. It did not include checking tank analyses against U, P, F, or K waste codes since application of these codes is dependent on the source of the waste and not on particular constituent concentrations. The results indicate that the waste in this tank is adequately described in the Dangerous Waste Permit Application for the Double-Shell Tank System.

1346 (WHC-SD-WM-ER-360) Tank characterization report for double-shell tank 241-AP-105. DeLorenzo, D.S.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001301. Source: OSTI; NTIS; INIS; GPO Dep.

Double-Shell Tank 241-AP-105 is a radioactive waste tank most recently sampled in March of 1993. Sampling and characterization of the waste in Tank 241-AP-105 contributes toward the fulfillment of Milestone M-44-05 of the Hanford Federal Facility Agreement and Consent Order (Ecology, EPA, and DOE, 1993). Characterization is also needed to evaluate the waste's fitness for safe processing through an evaporator as part of an overall waste volume reduction program. Tank 241-AP-105, located in the 200 East Area AP Tank Farm, was constructed and went into service in 1986 as a dilute waste receiver tank; Tank 241AP-1 05 was considered as a candidate tank for the Grout Treatment Facility. With the cancellation of the Grout Program, the final disposal of the waste in will be as high- and low-level glass fractions. The tank has an operational capacity of 1,140,000 gallons, and currently contains 821,000 gallons of double-shell slurry feed. The waste is heterogeneous, although distinct layers do not exist. Waste has been removed periodically for processing and concentration through the 242-A Evaporator. The tank is not classified as a Watch List tank and is considered to be sound. There are no Unreviewed Safety Questions associated with Tank 241-AP-105 at this time. The waste in Tank 241-AP-105 exists as an aqueous solution of metallic salts and radionuclides, with limited amounts of organic complexants. The most prevalent soluble analytes include aluminum, potassium, sodium, hydroxide, carbonate, nitrate, and nitrite. The calculated pH is greater than the Resource Conservation and Recovery Act

established limit of 12.5 for corrosivity. In addition, cadmium, chromium, and lead concentrations were found at levels greater than their regulatory thresholds. The major radionuclide constituent is ¹³⁷Cs, while the few organic complexants present include glycolate and oxalate. Approximately 60% of the waste by weight is water.

1347 (WHC-SD-WM-ER-361) Tank characterization report for Double-Shell Tank 241-AP-106. DeLorenzo, D.S. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); DiCenso, A.T.; Amato, L.C.; Stephens, R.H.; Hiller, D.B.; Simpson, B.C.; Welsh, T.L. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). Aug 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000526. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the characterization information and interprets the data for Double-Shell Tank AP-106.

1348 (WHC-SD-WM-ER-362) Tank characterization report for double-shell Tank 241-AP-107. DeLorenzo, D.S. (Los Alamos Technical Associates, Kennewick, WA (United States)); Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001227. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this tank characterization report is to describe and characterize the waste in Double-Shell Tank 241-AP-107 based on information gathered from various sources. This report summarizes the available information regarding the waste in Tank 241-AP-107, and arranges it in a useful format for making management and technical decisions concerning this particular waste tank. In addition, conclusion and recommendations based on safety and further characterization needs are given. Specific objectives reached by the sampling and characterization of the waste in Tank 241-AP-107 are: Contribute toward the fulfillment of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-44-05 concerning the characterization of Hanford Site high-level radioactive waste tanks; Complete safety screening of the contents of Tank 241-AP-107 to meet the characterization requirements of the Defense Nuclear Facilities Safety board (DNFSB) Recommendation 93-5; and Provide tank waste characterization to the Tank Waste Remediation System (TWRS) Program Elements in accordance with the TWRS Tank Waste Analysis Plan.

1349 (WHC-SD-WM-ER-363) Tank characterization report for double-shell Tank 241-AW-102. DiCenso, A.T. (Los Alamos Technical Associates, Kennewick, WA (United States)); Amato, L.C.; Franklin, J.D.; Nuttall, G.L.; Tran, T.T.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 28 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001468. Source: OSTI; NTIS; INIS; GPO Dep.

This Tank Characterization Report presents an overview of the waste transfer history of Tank 241-AW-102 and contains observations regarding waste characteristics which resulted from the 242-A Evaporator Campaign 94-1. The purpose of this report is to describe and characterize the waste in Tank 241-AW-102 based on information obtained from various

sources. Specific objectives for the sampling and characterization of the waste in Tank 241-AW-102 are to: Contribute toward the fulfillment of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) concerning the characterization of Hanford Site high-level radioactive waste tanks and provide tank waste characterization to the Tank Waste Remediation System (TWRS) Program Elements in accordance with the TWRS Tank Waste Analysis Plan. This report deviates from the standard format for Tank Characterization Reports because of the special nature of the tank. (Tank 241-AW-102 is the designated feed tank for the 242-A Evaporator; consequently, its level and waste composition are constantly changing.) Instead, a broad description of the tank and its historical background are presented. An estimation of the contents of Tank 241-AW-102 based on data presented in O'Rourke (1994) is also presented in this document. Finally, specific safety issues and program element needs are discussed.

1350 (WHC-SD-WM-ER-364) Tank characterization report for double-shell Tank 241-AW-105. DiCenso, A.T. (Los Alamos Technical Associates, Kennewick, WA (United States)); Amato, L.C.; Franklin, J.D.; Lambie, R.W.; Stephens, R.H.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 28 Sep 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001407. Source: OSTI; NTIS; INIS; GPO Dep.

In May 1990, double-shell Tank 241-AW-105 was sampled to determine proper handling of the waste, to address corrosivity and compatibility issues, and to comply with requirements of the Washington Administrative Code. This Tank Characterization Report presents an overview of that tank sampling and analysis effort, and contains observations regarding waste characteristics. It also addresses expected concentration and bulk inventory data for the waste contents based on this latest sampling data and background tank information. This report summarizes the available information regarding the waste in Tank 241-AW-105, and using the historical information to place the analytical data in context, arranges this information in a useful format for making management and technical decisions concerning this waste tank. In addition, conclusions and recommendations are given based on safety issues and further characterization needs.

1351 (WHC-SD-WM-ER-365) Tank characterization report for Double-Shell Tank 241-AW-106. DiCenso, A.T. (Los Alamos Technical Associates, Kennewick, WA (United States)); Amato, L.C.; Franklin, J.D.; Nuttall, G.L.; Tran, T.T.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001403. Source: OSTI; NTIS; INIS; GPO Dep.

Double-Shell Tank 241-AW-106 is an underground radioactive waste storage tank. Its supernatant volume was most recently sampled in December of 1993. The analytical data cited in this Tank Characterization Report were derived from this sampling event. Sampling and characterization of the waste in Tank 241-AW-106 contribute toward the fulfillment of Milestone M-44-05 of the Hanford Federal Facility Agreement and Consent Order (Ecology, EPA and DOE, 1993). Characterization will also provide support for Tank Farm Operations, safety programs, and design of retrieval, pretreatment, and disposal systems.

1352 (WHC-SD-WM-ER-367) Tank characterization report for Single-Shell Tank 241-C-110. Amato, L.C. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); Nuttall, G.L.; Johnson, K.W.; Lambie, R.W.; DiCenso, A.T.; Schreiber, R.D.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000466. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the characterization information and interprets the data for Single-Shell Tank C-110.

1353 (WHC-SD-WM-ER-368) Tank characterization report for single-shell Tank 241-B-110. Amato, L.C. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); De Lorenzo, D.S.; DiCenso, A.T.; Rutherford, J.H.; Stephens, R.H.; Heasler, P.G.; Brown, T.M.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). Aug 1994. 145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001164. Source: OSTI; NTIS; INIS; GPO Dep.

Single-shell Tank 241-B-110 is an underground storage tank containing radioactive waste. The tank was sampled at various times between August and November of 1989 and later in April of 1990. The analytical data gathered from these sampling efforts were used to generate this Tank Characterization Report. Tank 241-B-110, located in the 200 East Area B Tank Farm, was constructed in 1943 and 1944, and went into service in 1945 by receiving second cycle decontamination waste from the B and T Plants. During the service life of the tank, other wastes were added including B Plant flush waste, B Plant fission product waste, B Plant ion exchange waste, PUREX Plant coating waste, and waste from Tank 241-B-105. The tank currently contains 246,000 gallons of non-complexed waste, existing primarily as sludge. Approximately 22,000 gallons of drainable interstitial liquid and 1,000 gallons of supernate remain. The solid phase of the waste is heterogeneous, for the top layer and subsequent layers have significantly different chemical compositions and are visually distinct. A complete analysis of the top layer has not been done, and auger sampling of the top layer is recommended to fully characterize the waste in Tank 241-B-110. The tank is not classified as a Watch List tank; however, it is a Confirmed Leaker, having lost nearly 10,000 gallons of waste. The waste in Tank 241-B-110 is primarily precipitated salts, some of which are composed of radioactive isotopes. The most prevalent analytes include water, bismuth, iron, nitrate, nitrite, phosphate, silicon, sodium, and sulfate. The major radionuclide constituents are ^{137}Cs and ^{90}Sr .

1354 (WHC-SD-WM-ER-369) Tank characterization report for single-shell Tank 241-T-105. DiCenso, A.T. (Los Alamos Technical Associates, Kennewick, WA (United States)); Amato, L.C.; Franklin, J.D.; Nuttall, G.L.; Johnson, K.W.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). Sep 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001405. Source: OSTI; NTIS; INIS; GPO Dep.

Single-Shell Tank 241-T-105, an underground storage tank containing radioactive waste, was most recently sampled in March and May of 1993. Sampling and characterization of the waste in Tank 241-T-105 contribute toward

the fulfillment of Milestone M-44-05 of the Hanford Federal Facility Agreement and Consent Order. Tank 241-T-105, located in the 200 West Area T Tank Farm, was constructed in 1944 and went into service in July of 1946 by receiving second cycle decontamination waste from the T Plant. During the service life of the tank, other wastes were added including T Plant first cycle waste, PUREX Plant coating waste, laboratory waste, decontamination waste from T Plant, B Plant low level waste, and B Plant ion exchange waste. The tank currently contains 98,000 gal of non-complexed waste, existing primarily as sludge. Approximately 23,000 gal of drainable interstitial liquid remain. The waste is heterogeneous. Tank 241-T-105 is classified as a non-Watch List tank, with no Unreviewed Safety Questions associated with it at this time. The tank was Interim Stabilized in 1987 and Intrusion Prevention was completed in 1988. The waste in Tank 241-T-105 is comprised of precipitated salts, some of which contain traces of radioactive isotopes. The most prevalent analytes include aluminum, iron, silicon, manganese, sodium, uranium, nitrate, nitrite, and sulfate. The water digested sample results demonstrated that cadmium, chromium, lead, mercury, selenium, and silver concentrations were greater than their Toxicity Characteristic regulatory thresholds. The major radionuclide constituents are ^{90}Sr and ^{137}Cs . The waste is 74.1% solids by weight.

1355 (WHC-SD-WM-ER-370) Tank characterization report for single-shell tank 241-S-104. DiCenso, A.T.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001633. Source: OSTI; NTIS; INIS; GPO Dep.

In July and August 1992, Single-Shell Tank 241-S-104 was sampled as part of the overall characterization effort directed by the Hanford Federal Facility Agreement and Consent Order. Sampling was also performed to determine proper handling of the waste, to address corrosivity and compatibility issues, and to comply with requirements of the Washington Administrative Code. This Tank Characterization Report presents an overview of that tank sampling and analysis effort, and contains observations regarding waste characteristics. It also presents expected concentration and bulk inventory data for the waste contents based on this latest sampling data and background historical and surveillance tank information. Finally, this report makes recommendations and conclusions regarding operational safety. The purpose of this report is to describe the characteristics the waste in Single-Shell Tank 241-S-104 (hereafter, Tank 241-S-104) based on information obtained from a variety of sources. This report summarizes the available information regarding the chemical and physical properties of the waste in Tank 241-S-104, and using the historical information to place the analytical data in context, arranges this information in a format useful for making management and technical decisions concerning waste tank safety and disposal issues. In addition, conclusions and recommendations are presented based on safety issues and further characterization needs.

1356 (WHC-SD-WM-ER-372) Tank characterization report for single-shell tank 241-T-104. DiCenso, A.T.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001632. Source: OSTI; NTIS; INIS; GPO Dep.

In August 1992, Single-Shell Tank 241-T-104 was sampled to determine proper handling of the waste, to address corrosivity and compatibility issues, and to comply with requirements of the Washington Administrative Code (Ecology, 1991). This Tank Characterization Report presents an overview of that tank sampling and analysis effort, and contains observations regarding waste characteristics. It also addresses expected concentration and bulk inventory data for the waste contents based on this latest sampling data and background tank information. The purpose of this report is to describe and characterize the waste in Single-Shell Tank 241-T-104 (hereafter, Tank 241-T-104) based on information given from various sources. This report summarizes the available information regarding the waste in Tank 241-T-104, and using the historical information to place the analytical data in context, arranges this information in a useful format for making management and technical decisions concerning this waste tank. In addition, conclusions and recommendations are given based on safety issues and further characterization needs.

1357 (WHC-SD-WM-ER-373) Dome load control and crane land path evaluation for Tank 241-SY-101 during hydrogen mitigation pump removal and installation. Weis, M.P.; Lawler, D.M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002208. Source: OSTI; NTIS; GPO Dep.

This report revisits and consolidates two analyses previously performed for the installation of the Hydrogen Mitigation Pump (HMT) pump. The first report determines, as a function of the crane-imposed dome load, the point to which the crane can encroach into the exclusion zone without exceeding the 50-ton limit. The second performs a load evaluation for the crane and the components in the load path (crane lift accessories and pump). In doing so, it determines the weakest component in the load path and the effect of this component on the allowable encroachment distance. Furthermore, the second report sets operational limits on the allowable load decrease (unload) during installation in the event the pump sticks in the riser. The analysis presented here expands on the latter subject by setting an operational limit on the amount of allowable load increase (overload) during pump removal in the event the pump sticks in the riser.

1358 (WHC-SD-WM-ER-375) Thermal analysis for determination for maximum pool temperatures for the K East and K West spent fuel storage basins. Barrington, C.A. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 193p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003168. Source: OSTI; NTIS; INIS; GPO Dep.

Models of pool temperature behavior in the 105 K East and K West fuel storage basins were proposed. These models were coded in FORTRAN and benchmarked with observations made from 1990 to 1992. Ninety-eight percent, or more, of variation in the observations were explained by the models. The models were then used to predict thermal behavior of the fuel storage pools under hypothetical worst-case scenarios.

1359 (WHC-SD-WM-ER-377) Riser configuration, Tank 241-A-105, light duty utility arm. Boucher, T.D. Westinghouse Hanford Co., Richland, WA (United States);

Kaiser Engineers Hanford Co., Richland, WA (United States). 8 Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-93RL12359. Order Number DE95000308. Source: OSTI; NTIS; INIS; GPO Dep.

The light-duty utility arm (LDUA) is a seven-joint stainless steel robotic arm with a payload capacity of 75 lb. The robotic arm is deployed vertically with a maximum vertical reach of 63 ft. and a maximum horizontal reach of 13.5 ft. The functional requirements of the LDUA system are mapping and characterization of waste in Hanford single-shell tanks (SST) before and during waste retrieval. The LDUA system consists of a mobile deployment system (MDS), a vertical positioning mast (VPM), a tank riser interface confinement (TRIC), the LDUA, and a controller subsystem or support traller. Currently, the system is in design and is subject to change; however, the LDUA or robotic arm will be deployed through a 12-in. riser above the tank dome. Field trips were performed to gather specifics for future deployment of the LDUA in Tank 241-A-105. The purpose of this report is to support two previous reports for the investigation of SSTs for deployment of the LDUA system. The first report identified the availability of risers while the second report identified the availability of Tanks 241-A-105, 241-A-S-109, 241-A-T-101, and 241-A-T-109 for deployment of the LDUA system. The second report also identified those 4- and 12-in. risers that could be used for deployment of the LDUA and camera system. This report addresses accessibility to the 241-A Tank Farm and the usability of the Tank 241-A-105 risers. The following information for assisting in the design and deployment of the LDUA will be discussed in this report: radiation survey; flange identification; high resolution video; computer simulated model; and field survey.

1360 (WHC-SD-WM-ER-379) An assessment of the potential for a steam bump in Hanford Waste Tank 241-C-106. Bander, T.J.; Crea, B. Westinghouse Savannah River Co., Aiken, SC (United States). 28 Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002092. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a preliminary assessment of the potential for a "steam bump" in Tank 241-C-106. The assessment is based on currently available data from significant transients which occurred in Tank C-106. Recommendations are made for additional data needs to clarify the current behavior of this tank. General criteria are provided for making decisions on removing or returning to work restrictions on Tank Farm operations. Also provided are additional actions which should be taken on C-106 to manage tank heat removal.

1361 (WHC-SD-WM-ER-380) Stress analysis of core sampler truck number 2 platform: 2,000 LBF crane lift capacity. Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002370. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the structural analysis and evaluation of the platform of core sampler truck #2 for 2,000 lbf crane lift capacity.

1362 (WHC-SD-WM-ER-381) Engineering evaluation of intrusion prevention strategies for single-shell tanks. Jenkins, C.E. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 111p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001406. Source: OSTI; NTIS; INIS; GPO Dep.

In this study, previously implemented actions to prevent liquid intrusion into out-of-service single-shell tanks (SSTs), i.e., interim isolation or partial interim isolation, are investigated and expanded to identify additional cost-effective intrusion prevention techniques that could be reasonably taken until SSTs are ready for waste retrieval. Possible precipitation, groundwater, and condensation pathways and internal tank connections that could provide possible pathways for liquids are examined. Techniques to block identified potential pathways are developed and costed to determine the potential benefit to costed trade-offs for implementing the techniques. (Note: Surveillance data show increased waste surface levels for several SSTs that indicate possible liquid intrusion despite interim isolation activities.)

1363 (WHC-SD-WM-ER-382) Tank characterization report for Single-Shell Tank 241-T-107. Valenzuela, B.D.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 179p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002095. Source: OSTI; NTIS; INIS; GPO Dep.

Single shell tank 241-T-107 is a Hanford Site Ferrocyanide Watch List tank most recently sampled in March 1993. Analyses of materials obtained from tank T-107 were conducted to support the Ferrocyanide Unreviewed Safety Question (USQ) and the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-10-06 as well as Milestones M-44-05 and M-44-07. Characterization of the tank waste T-107 will support the ferrocyanide safety issue in order to classify the tank as safe, conditionally safe, or unsafe. This tank characterization report expands on the data found in Ferrocyanide Safety Program: Data Interpretation Report for Tank 241-T-107 Core Samples. Analysis of core samples obtained from tank T-107 strongly indicate the cyanide and oxidizer (nitrate/nitrite) concentrations in the tank waste are not significant enough to support a self-sustaining exothermic reaction. Therefore, the contents of tank T-107 present no imminent threat to the workers at the Hanford Site, the public, or the environment. Because the possibility of an exothermic reaction is remote, the consequences of an accident scenario, as proposed by the General Accounting Office, are not applicable.

1364 (WHC-SD-WM-ER-383) Uncertainties in the measured quantities of water leaving waste Tank 241-C-106 via the ventilation system. Minter, D.J. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006904. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this analysis is to estimate the uncertainty in the measured quantity of water which typically leaves Tank 241-C-106 via the ventilation system each month. Such measurements are essential for heat removal estimation and tank liquid level verification purposes. The uncertainty associated with the current, infrequent, manual method of measurement (involves various psychrometric and pressure measurements) is suspected to be unreasonably high. Thus, the possible reduction of this uncertainty using a continuous, automated method of measurement will also be estimated. There are three major conclusions as a result of this analysis: (1) the uncertainties associated with the current (infrequent, manual) method of measuring the

water which typically leaves Tank 241-C-106 per month via the ventilation system are indeed quite high (80% to 120%); (2) given the current psychrometric and pressure measurement methods and any tank which loses considerable moisture through active ventilation, such as Tank 241-C-106, significant quantities of liquid can actually leak from the tank before a leak can be positively identified via liquid level measurement; (3) using improved (continuous, automated) methods of taking the psychrometric and pressure measurements, the uncertainty in the measured quantity of water leaving Tank 241-C-106 via the ventilation system can be reduced by approximately an order of magnitude.

1365 (WHC-SD-WM-ER-386) Effect of atmospheric humidity on CPAC optical moisture prediction models - interim report. Veltkamp, D. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003274. Source: OSTI; NTIS; INIS; GPO Dep.

The tank head space water vapor will be a strong interference of the NIR system as a non-contact camera sensor. The impact of water vapor can be compensated for by explicitly including the water vapor spectral response in the NIR spectra used to generate the PLS (partial least squares) calibration model. PLS models constructed with NIR spectra where water vapor absorption was included as an interferant (from a LOWTRAN computer atmospheric absorption model) predicted moisture from NIR spectra with RMSE (root mean square error) fit errors in the range of 0.729-0.743 wt% moisture. This error correlates well with tank needs and earlier prediction test data where the water vapor was ignored. The models worked equally well with or without the water vapor interferant present in the sensed NIR spectra. Water vapor can also be compensated for if the humidity of the tank head space is measured and the path length between NIR system and waste surface is measured. A simulation using water vapor data from a LOWTRAN atmospheric model, showed wt% moisture values. The conclusion is that water vapor is a strong interferant in waste applications of NIR moisture sensing, however, it can be compensated for with only a small impact on the sensing models and their prediction accuracy.

1366 (WHC-SD-WM-ER-387) Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor). Wootan, D.W.; Bolden, R.C.; Bridges, A.E.; Cannon, N.S.; Chastain, S.A.; Hey, B.E.; Knight, R.C.; Linschooten, C.G.; Pitner, A.L.; Webb, B.J. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002091. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes work performed in Fiscal Year 1994 to develop the three main components of Retained Gas Sampler System (RGSS). These primary components are the Retained Gas Sampler (RGS), the Retained Gas Extruder (RGE), and the Retained Gas Extractor (RGEx). The RGS is based on the Westinghouse Hanford Company (WHC) Universal Sampler design, and includes modifications to reduce gas leakage. The primary data priorities for the RGSS are to measure the void fraction and the flammable gas concentration in the waste sample. Significant progress has been made in developing the RGSS. The RGSS is being developed by WHC to extract a representative waste sample from a Flammable Gas Watch List Tanks and to

measure both the amount and composition of free and "bound" gases. Sudden releases of flammable gas mixtures are a safety concern for normal waste storage operations and eventual waste retrieval. Flow visualization testing was used to identify important fluid dynamic issues related to the sampling process. The primary data priorities for the RGSS are to measure the void fraction and the flammable gas concentration in the waste sample. The safety analysis for the RGSS is being performed by Los Alamos National Laboratory and is more than sixty percent (60%) complete.

1367 (WHC-SD-WM-ER-390) Stress analysis of shielded receiver lifting frame for core sampler truck #2. Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 272p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003868. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis evaluates the structural design adequacy of the shielded receiver lifting frame (SRLF) for the rotary mode core sampler truck number 2 (RMCST#2). The analysis considers the loads expected during operation of the SRLF. Most of the existing welds were not in conformance with those specified on the drawings, H-2-91715 and -91716 (RHO 1988a and RHO 1988b). Stress analysts and engineers examined the configuration of the welds connecting the frame members of the SRLF and those connecting the SRLF to the drill rig. In comparison to those shown on the drawing, some of the actual welds appear stronger and others undersized. For example, the actual fillet welds completely encircle the junctures of members, although the drawings show some welds to be on two sides only. Attempts to find the original design calculations were unsuccessful. To resolve the nonconformance, the critical welds were identified by analysis and subsequently inspected to ensure they are as large or larger than the minimum is defined by weld leg size. A required weld size, as determined by stress analysis, of 0.1 inch or larger is considered to be critical. This size was selected because no existing welds were found to be less than 0.125 inch. Analysis results led to weld modifications to strengthen the SRLF. The weld modifications performed are described in WHC 1994.

1368 (WHC-SD-WM-ER-391) Rollover analysis of rotary mode core sampler truck No. 2. Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005429. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides estimate of limiting speed and rollover analysis of rotary mode core sampler truck No. 2 (RMCST No. 2).

1369 (WHC-SD-WM-ER-392) Stress analysis of jacks, frame and bearing connections, and drill rod for core sampler truck No. 2. Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008479. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis evaluates the structural design adequacy of several components and connections for the rotary mode core sampler truck (RMCST) No. 2. This analysis was requested by the Characterization Equipment Group (WHC 1994a). The components addressed in this report are listed below: front jack assembly and connection to the truck chassis; rear jack assembly and connection to the truck chassis;

center outrigger jacks and connection to the truck chassis; lower frame assembly and connection to the truck chassis; bolt connections for bearing plate assembly (for path of maximum load); traverse slide brackets and mounting of the traverse jack cylinders; and drill rod (failure loads).

1370 (WHC-SD-WM-ER-393) Seismic qualification of a switch box. Miller, S.M. Westinghouse Hanford Co., Richland, WA (United States). 23 Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004365. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document details the results of a seismic analysis on a switch box assembly. The switch box is mounted to a Unistrut frame and is attached to the concrete floor in the 225B Building with Hilti Kwik bolts. The assembly was found to meet safety class 3 requirement. Although all components analyzed were found to be structurally adequate, some changes are recommended. To comply with SDC 4.2 specification, the Hilti Kwik bolts should be: placed at least 8 1/4 inches from the edge of the concrete floor; should have a minimum spacing of 8 inches from any Kwik bolt; and should be embedded 5 1/2 inches into the concrete. The minimum embedment distance is 2 3/4 inches. Furthermore, when the bolts are installed, rebar within the concrete should not be cut or damaged. Finally, the length of the Hilti Kwik bolt should be sized such that the distance from the top of the bolt to the top of the nut is not less than 2 thread pitches, and not more than 3/4 inch.

1371 (WHC-SD-WM-ER-394) Buckling of the Tank 241SY101 primary liner. Marlow, R.S. Westinghouse Hanford Co., Richland, WA (United States). 19 Dec 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010229. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the computation of the buckling pressure of the primary liner of Tank 241SY101. It describes the calculation of the negative gauge pressure required to buckle the liner. A negative pressure may develop inside the tank when water is sprayed on the hydrogen mitigation pump during its removal. Calculations indicate that the liner will buckle at 23,442 Pa, or 239 cm of water.

1372 (WHC-SD-WM-ER-395) Technical description of Stack 296-B-5. Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003766. Source: OSTI; NTIS; INIS; GPO Dep.

Of particular concern to facilities on the Hanford site is Title 40, Code of Federal Regulations, Chapter 40, Part 61, Subpart H, "National emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities." Assessments of facility stacks and potential radionuclide emissions determined whether these stacks would be subject to the sampling and monitoring requirements of 40 CFR 61, Subpart H. Stack 296-B-5 exhausts 221-BB building which houses tanks containing B Plant steam condensate and B Plant process condensate from the operation of the low-level waste concentrator. The assessment of potential radionuclide emissions from the 296-B-5 stack resulted in an effective dose equivalent to the maximally exposed individual of less than 0.1 millirem per year. Therefore, the stack is not subject to the sampling and monitoring requirements of 40 CFR 61, Subpart H. However, the sampling and monitoring system must be in

compliance with the Environmental Compliance Manual, WHC-CM-7-5. Currently, 296-B-5 is sampled continuously with a record sampler and continuous air monitor (CAM).

1373 (WHC-SD-WM-ER-397) CPAC optical moisture monitoring: Characterization of composition and physical effects on moisture determination Task 2A report. Veltkamp, D.J. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005143. Source: OSTI; NTIS; INIS; GPO Dep.

The impact of particle size and chemical composition variations on determination of tank simulant moisture from near infrared (NIR) optical spectra are presented. This work shows particle size and chemical variations will impact moisture predictions from NIR spectra. However, the prediction errors can be minimized if calibration models are built with samples containing these variations as interferences. Prior work showed the NIR spectral region (1100 to 2500 nm) could be used to predict moisture content of BY-104 tank simulant with a standard error less of approximately 0.5 wt%. Particle size will increase moisture prediction error if calibration-models do not include the same particle size ranges as unknown samples. A combined particle size model with 0-420 $\times 10^{-6}$ m, 420-841 $\times 10^{-6}$ m, and 841 $\times 10^{-6}$ m-2 mm diameter particles predicted 0.59, 0.34 and 0.23 wt% errors respectively for samples containing only these size ranges and 0.80 wt% error for a samples with all particle size ranges. Chemical composition would also increase moisture prediction error if calibration model samples chemically differ from unknown samples. For a BY-104 simulant, increases in NaOH, NaAlO₂, Na₂ SiO₃, and Na₃PO₄ produced moisture predictions that were lower than the actual moisture levels while increases in Fe(NO₃)₃, Ca(NO₃)₂, and Mg (NO₃)₂ resulted in a higher than actual moisture prediction. Systematic changes in the NIR spectra could be observed for these families of materials. When all of the composition variations were included in a single model, the model had a moisture prediction error of 1.41 wt% as compared to a 2.96 wt% error without model changes. This work shows a calibration model based on a single set of tightly controlled experimental conditions will tend to have somewhat larger prediction errors when applied to samples collected with variations outside of such conditions.

1374 (WHC-SD-WM-ER-399) Investigation of remote sensing scale up for hot cell waste tank applications. CPAC optical moisture monitoring. Jones, P.L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018000. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses work done to investigate the feasibility of using non-contact optical absorption to remotely sense the surface moisture content of salt cake materials. Optical measurements were made in a dimensionally scaled setup to investigate this technique for in-situ waste tank applications. Moisture measurements were obtained from BY-104 simulant samples with 0 wt%, 10 wt%, and 20 wt% moisture content using the back-scattered light from a pulsed infrared optical parametric converter (OPC) laser source operating from 1.51 to 2.12 micron. An InGaAs detector, with 0.038 steradian solid angle (hemisphere = 6.28 steradians) collection angle was used to detect the back-scattered light. This work indicated that there was sufficient

back-scatter from the BY-104 material to provide an indication of the surface moisture content.

1375 (WHC-SD-WM-ER-399-Rev.) Technical description of stack 296-B-10. Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005616. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a technical description of the systems associated with the 296-B-10 stack.

1376 (WHC-SD-WM-ER-402) Tank characterization report for single-shell tank 241-C-109. DiCenso, A.T. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); Amato, L.C.; Lambie, R.W.; Franklin, J.D.; Seymour, B.J.; Johnson, K.W.; Stevens, R.H.; Remund, K.M.; Sasaki, L.M.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008414. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the characterization information and interprets the data for Single-Shell Tank 241-C-109. Single-Shell Tank 241-C-109 is an underground storage tank containing high-level radioactive waste. It is located in the C Tank Farm in the Hanford Site's 200 East Area. The tank was sampled in September of 1992 to address the Ferrocyanide Unreviewed Safety Question. Analyses of tank waste were also performed to support Hanford Federal Facility Agreement and Consent Order Milestone M-44-08. Tank 241-C-109 went into service in 1946 and received first-cycle decontamination waste from bismuth phosphate process operations at B Plant in 1948. Other waste types added that are expected to contribute to the current contents include ferrocyanide scavenging waste and Strontium Semiworks waste. It is the last tank in a cascade with Tanks 241-C-107 and 241-C-108. The tank has a capacity of 2,010 kL (530 kgal) and currently contains 250 kL (66 kgal) of waste, existing primarily of sludge. Approximately 9.15 kL (4 kgal) of supernate remain. The sludge is heterogeneous, with significantly different chemical compositions depending on waste depth. The major waste constituents include aluminum, calcium, iron, nickel, nitrate, nitrite, phosphate, sodium, sulfate and uranium. The major radionuclides present are Cesium 137 and Strontium 90. The results of this characterization indicate that the waste in this tank is adequately described in the Dangerous Waste Permit Application of the Single-Shell Tank System.

1377 (WHC-SD-WM-ER-415) Rotary Mode Core Sample System availability improvement. Jenkins, W.W. (Westinghouse Hanford Co., Richland, WA (United States)); Bennett, K.L.; Potter, J.D.; Cross, B.T.; Burkes, J.M.; Rogers, A.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008463. Source: OSTI; NTIS; INIS; GPO Dep.

The Rotary Mode Core Sample System (RMCSS) is used to obtain stratified samples of the waste deposits in single-shell and double-shell waste tanks at the Hanford Site. The samples are used to characterize the waste in support of ongoing and future waste remediation efforts. Four sampling trucks have been developed to obtain these samples. Truck 1 was the first in operation and is currently being used to obtain samples where the push mode is appropriate (i.e., no

rotation of drill). Truck 2 is similar to truck 1, except for added safety features, and is in operation to obtain samples using either a push mode or rotary drill mode. Trucks 3 and 4 are now being fabricated to be essentially identical to truck 2.

1378 (WHC-SD-WM-ER-417) Sampler bias - Phase 1. Blanchard, R.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008884. Source: OSTI; NTIS; INIS; GPO Dep.

This documents Phase 1 determinations on sampler induced bias for four sampler types used in tank characterization. Each sampler, grab sampler or bottle-on-a-string, auger sampler, sludge sampler and universal sampler, is briefly discussed and their physical limits noted. Phase 2 of this document will define additional testing and analysis to further define Sampler Bias.

1379 (WHC-SD-WM-ER-431) Core sampling system spare parts assessment. Walter, E.J. Westinghouse Hanford Co., Richland, WA (United States). 4 Apr 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010135. Source: OSTI; NTIS; INIS; GPO Dep.

Soon, there will be 4 independent core sampling systems obtaining samples from the underground tanks. It is desirable that these systems be available for sampling during the next 2 years. This assessment was prepared to evaluate the adequacy of the spare parts identified for the core sampling system and to provide recommendations that may remediate overages or inadequacies of spare parts.

1380 (WHC-SD-WM-ES-185) Electrical distribution studies for the 200 Area tank farms. Fisler, J.B. Westinghouse Hanford Co., Richland, WA (United States). 26 Aug 1994. 686p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019012. Source: OSTI; NTIS; INIS; GPO Dep.

This is an engineering study providing reliability numbers for various design configurations as well as computer analyses (Captor/Dapper) of the existing distribution system to the 480V side of the unit substations. The objective of the study was to assure the adequacy of the existing electrical system components from the connection at the high voltage supply point through the transformation and distribution equipment to the point where it is reduced to its useful voltage level. It also was to evaluate the reasonableness of proposed solutions of identified deficiencies and recommendations of possible alternate solutions. The electrical utilities are normally considered the most vital of the utility systems on a site because all other utility systems depend on electrical power. The system accepts electric power from the external sources, reduces it to a lower voltage, and distributes it to end-use points throughout the site. By classic definition, all utility systems extend to a point 5 feet from the facility perimeter. An exception is made to this definition for the electric utilities at this site. The electrical Utility System ends at the low voltage section of the unit substation, which reduces the voltage from 13.8 kV to 2,400, 480, 277/480 or 120/208 volts. These transformers are located at various distances from existing facilities. The adequacy of the distribution system which transports the power from the main substation to the individual area substations and other load centers is evaluated and factored into the impact of the future load forecast.

1381 (WHC-SD-WM-ES-290) Chemical compatibility of tank wastes in tanks 241-C-106, 241-AY-101, and 241-AY-102: Revision 1. Sederburg, J.P. Westinghouse Hanford Co., Richland, WA (United States). 4 May 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94012936. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the chemical compatibility of waste types within tanks 241-C-106, 241-AY-101, and 241-AY-102. This information was compiled to facilitate the transfer of tank 241-C-106 waste to tank 241-AY-102 utilizing supernatant from tank 241-AY-101 as the sluicing medium. This document justifies that no chemical compatibility safety issues currently understood, or theorized from thermodynamic modeling, will result from the intended sluice transfer operation.

1382 (WHC-SD-WM-ES-290-Rev.2) Chemical compatibility of tank wastes in 241-C-106, 241-AY-101, and 241-AY-102. Sederburg, J.P. Westinghouse Hanford Co., Richland, WA (United States). 3 Aug 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001232. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the chemical compatibility of waste types within tanks 241-C-106, 241-AY-101, and 241-AY-102. This information was compiled to facilitate the transfer of tank C-106 waste to tank AY-102 utilizing supernatant from AY-101 as the sluicing medium. This document justifies that no chemical compatibility safety issues currently understood, or theorized from thermodynamic modeling, will result from the intended sluice transfer operation.

1383 (WHC-SD-WM-ES-299) Engineering study - Installation of new risers in Single-Shell Tanks. Magruder, W.J. Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Aug 1994. 245p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930; AC06-93RL12359. Order Number DE95000522. Source: OSTI; NTIS; INIS; GPO Dep.

A sampling program is being developed to characterize the 149 underground SSTs on the Hanford Site. The sampling effort will require access to the tank interior in a minimum of two locations per tank. Some of the risers suitable for sampling are either unavailable or are not in locations for proper characterization of the tank contents. Additional risers will be required in the SSTs to support the tank characterization sampling program. The purpose of this engineering study is to review alternatives for installation of new riser in the SSTs.

1384 (WHC-SD-WM-ES-300) Feasibility study of tank leakage mitigation using subsurface barriers. Treat, R.L. (Ensearch Environmental, Inc. (United States)); Peters, B.B.; Cameron, R.J.; McCormak, W.D.; Trenkler, T.; Walters, M.F.; Rouse, J.K.; McLaughlin, T.J.; Cruse, J.M. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1994. 355p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001511. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has established the Tank Waste Remediation System (TWRS) to safely manage and dispose of the waste currently stored in the underground storage tanks. The retrieval element of TWRS includes a work scope to develop subsurface impermeable barriers beneath SSTs. The barriers could serve as a means

to contain leakage that may result from waste retrieval operations and could also support site closure activities by facilitating cleanup. Three types of subsurface barrier systems have emerged for further consideration: (1) chemical grout, (2) freeze walls, and (3) desiccant, represented in this feasibility study as a circulating air barrier. This report contains analyses of the costs and relative risks associated with combinations retrieval technologies and barrier technologies that from 14 alternatives. Eight of the alternatives include the use of subsurface barriers; the remaining six nonbarrier alternative are included in order to compare the costs, relative risks and other values of retrieval with subsurface barriers. Each alternative includes various combinations of technologies that can impact the risks associated with future contamination of the groundwater beneath the Hanford Site to varying degrees. Other potential risks associated with these alternatives, such as those related to accidents and airborne contamination resulting from retrieval and barrier emplacement operations, are not quantitatively evaluated in this report.

1385 (WHC-SD-WM-ES-300-Rev.1) Feasibility study of tank leakage mitigation using subsurface barriers. Revision 1. Treat, R.L. (Ensearch Environmental, Inc., Richland, WA (United States)); Peters, B.B.; Cameron, R.J. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 605p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005533. Source: OSTI; NTIS; INIS; GPO Dep.

This document reflects the evaluations and analyses performed in response to Tri-Party Agreement Milestone M-45-07A - "Complete Evaluation of Subsurface Barrier Feasibility" (September 1994). In addition, this feasibility study was revised reflecting ongoing work supporting a pending decision by the DOE Richland Operations Office, the Washington State Department of Ecology, and the US Environmental Protection Agency regarding further development of subsurface barrier options for SSTs and whether to proceed with demonstration plans at the Hanford Site (Tri-Party Agreement Milestone M-45-07B). Analyses of 14 integrated SST tank farm remediation alternatives were conducted in response to the three stated objectives of Tri-Party Agreement Milestone M-45-07A. The alternatives include eight with subsurface barriers and six without. Technologies used in the alternatives include three types of tank waste retrieval, seven types of subsurface barriers, a method of stabilizing the void space of emptied tanks, two types of in situ soil flushing, one type of surface barrier, and a clean-closure method. A no-action alternative and a surface-barrier-only alternative were included as nonviable alternatives for comparison. All other alternatives were designed to result in closure of SST tank farms as landfills or in clean-closure. Revision 1 incorporates additional analyses of worker safety, large leak scenarios, and sensitivity to the leach rates of risk controlling constituents. The additional analyses were conducted to support TPA Milestone M-45-07B.

1386 (WHC-SD-WM-ES-303) Concept study: Use of grout vaults for disposal of long-length contaminated equipment. Clem, D.K. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000984. Source: OSTI; NTIS; INIS; GPO Dep.

Study considers the potential for use of grout vaults for disposal of untreated long length equipment removed from waste tanks. Looks at ways to access vaults, material

handling, regulatory aspects, and advantages and disadvantages of vault disposal.

1387 (WHC-SD-WM-ES-310) Tank waste concentration mechanism study. Pan, L.C.; Johnson, L.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003067. Source: OSTI; NTIS; INIS; GPO Dep.

This study determines whether the existing 242-A Evaporator should continue to be used to concentrate the Hanford Site radioactive liquid tank wastes or be replaced by an alternative waste concentration process. Using the same philosophy, the study also determines what the waste concentration mechanism should be for the future TWRS program. Excess water from liquid DST waste should be removed to reduce the volume of waste feed for pretreatment, immobilization, and to free up storage capacity in existing tanks to support interim stabilization of SSTs, terminal cleanout of excess facilities, and other site remediation activities.

1388 (WHC-SD-WM-ES-311) Tri-Party Agreement Milestone M-45-07A; complete evaluation of subsurface barrier feasibility: Summary report. Cox, G.E. (Enserch Environmental Corp., Richland, WA (United States)); Peters, B.B.; Treat, R.L.; Bazinet, G.D.; Cruse, J.M.; Hampsten, K.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001512. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has established the Tank Waste Remediation System (TWRS) program to safely manage and dispose the low-level and high-level radioactive and hazardous wastes currently held in 177 tanks and approximately 1,900 sealed capsules located on the Hanford Site. The remediation of the entire Hanford Site is being conducted under the Hanford Federal Facility Agreement and Consent Order, otherwise known as the Tri-Party Agreement. The three parties that concluded the agreement are the DOE, the US Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology). The purpose of the Tri-Party Agreement is to ensure that Hanford Site activities are performed in a manner that protects the public health, welfare, and the environment. The agreement provides a framework and structure for the many different agencies and regulations under which work is performed on the Site, listing responsibilities and attaching scheduled dates of completion for minimum performances (known as milestones). The Tri-Party Agreement Milestone M-45-07A requires that an assessment of the feasibility of subsurface barriers to support retrieval of tank waste be performed. The activities to meet this milestone have been completed, and are documented herein.

1389 (WHC-SD-WM-ES-312) Computer simulation of laboratory leaching and washing of tank waste sludges. Meng, C.D.; MacLean, G.T.; Landeene, B.C. Westinghouse Hanford Co., Richland, WA (United States). 21 Oct 1994. 292p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003244. Source: OSTI; NTIS; INIS; GPO Dep.

The process simulator ESP (Environmental Simulation Program) was used to simulate laboratory caustic leaching and washing of core samples from Tanks B-110, C-109, and C-112. The results of the laboratory tests and the computer simulations are compared. The results from both, agreed

reasonably well for elements contained in solid phases included in the ESP Public data bank. The use of the GEOCHEM data bank and/or a custom Hanford Data bank should improve the agreement, making ESP a useful process simulator for aqueous based processing.

1390 (WHC-SD-WM-ES-314) Decontamination trade study for the Light Duty Utility Arm. Rieck, R.H. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001595. Source: OSTI; NTIS; INIS; GPO Dep.

Various methods were evaluated for decontaminating the Light Duty Utility Arm (LDUA). Physical capabilities of each method were compared with the constraints and requirements for the LDUA Decontamination System. Costs were compared and a referred alternative was chosen.

1391 (WHC-SD-WM-ES-316) Storage options for Long Length Contaminated Equipment (LLCE) Items. Hodgson, R.D. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005430. Source: OSTI; NTIS; INIS; GPO Dep.

A review of the Washington state requirements for the storage of long equipment items removed from tanks indicate that if the contaminated materials on the long equipment items are analyzed and determined to be DW, and not EHW, the containers can be stored on an uncovered, RCRA approved, storage pad. Long equipment items contaminated with reportable levels of EHW, or suspected of being contaminated with EHW, must be protected from the elements by means of a building or other protective covering that otherwise allows adequate inspection of the containers. Storage of the long equipment item containers on an uncovered storage pad is recommended and will reduce construction costs for new storage by an estimated 60 percent when compared to construction costs for enclosed storage.

1392 (WHC-SD-WM-ES-318) Sample storage/disposal study. Valenzuela, B.D. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001371. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive waste from defense operations has accumulated at the Hanford Site's underground waste tanks since the late 1940's. Each tank must be analyzed to determine whether it presents any harm to the workers at the Hanford Site, the public or the environment. Analyses of the waste aids in the decision making process in preparation of future tank waste stabilization procedures. Characterization of the 177 waste tanks on the Hanford Site will produce a large amount of archived material. This also brings up concerns as to how the excess waste tank sample material from 325 and 222-S Analytical Laboratories will be handled. Methods to archive and/or dispose of the waste have been implemented into the 222-S and 325 Laboratory procedures. As the amount of waste characterized from laboratory analysis grows, an examination of whether the waste disposal system will be able to compensate for this increase in the amount of waste needs to be examined. Therefore, the need to find the safest, most economically sound method of waste storage/disposal is important.

1393 (WHC-SD-WM-ES-320) Organic decontamination by ion exchange. Wilson, T.R. (Westinghouse Hanford

Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Science Applications International Corp., Richland, WA (United States). 30 Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Contract MRS-SVV-315924. Order Number DE95001545. Source: OSTI; NTIS; INIS; GPO Dep.

This study has successfully identified ion exchanger media suitable for decontaminating the 5500-gallon organic layer in Tank 241-C-103. Decontamination of radionuclides is necessary to meet shipping, incinerator site storage, and incineration feed requirements. The exchanger media were identified through a literature search and experiments at the Russian Institute for Physical Chemistry. The principal radionuclides addressed are Cs-137 and Sr-90. Recommendations for an experimental program plan conclude the discussion. The experimental program would provide the data necessary for plant design specifications for a column and for ion exchange media to be used in decontaminating the organic layer.

1394 (WHC-SD-WM-ES-328) Tank selection for Light Duty Utility Arm (LDUA) system hot testing in a single shell tank. Bhatia, P.K. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 519p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007179. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to recommend a single shell tank in which to hot test the Light Duty Utility Arm (LDUA) for the Tank Waste Remediation System (TWRS) in Fiscal Year 1996. The LDUA is designed to utilize a 12 inch riser. During hot testing, the LDUA will deploy two end effectors (a High Resolution Stereoscopic Video Camera System and a Still/Stereo Photography System mounted on the end of the arm's tool interface plate). In addition, three other systems (an Overview Video System, an Overview Stereo Video System, and a Topographic Mapping System) will be independently deployed and tested through 4 inch risers.

1395 (WHC-SD-WM-ES-330) PWR Core II blanket fuel disposition recommendation of storage option study. Dana, C.M. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005071. Source: OSTI; NTIS; INIS; GPO Dep.

After review of the options available for current storage of T Plant Fuel the recommended option is wet storage without the use of chillers. A test has been completed that verifies the maximum temperature reached is below the industrial standard for storage of spent fuel. This option will be the least costly and still maintain the fuel in a safe environment. The options that were evaluated included dry storage with and without chillers, and wet storage with and without chillers. Due to the low decay heat of the Shippingport Core II Blanket fuel assemblies the fuel pool temperature will not exceed 100 deg. F.

1396 (WHC-SD-WM-ES-334) Bibliography of documents pertaining to retrieval of waste from Hanford single-shell tanks. Gibbons, P.W. Westinghouse Hanford Co., Richland, WA (United States). 17 Apr 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010738. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a listing of several studies, reports, papers, testing programs, and other pertinent data associated with single-shell tank (SST) waste retrieval methods. The documents were reviewed and divided into seven groups: arm-based retrieval demonstration, tank waste characterization for retrieval, light-duty utility arm, national robotics program, underground storage tank integrated demonstration management documents, waste dislodging and conveyance program, and miscellaneous. Letter reports are attached in the Appendix to assure availability.

1397 (WHC-SD-WM-ES-335) 101-SY Dome pressure issues surrounding mitigation pump decontamination during removal. Shaw, S.W. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008410. Source: OSTI; NTIS; INIS; GPO Dep.

This document addresses issues related to use of the spraywands and ring used to decontaminate the mitigation pump installed in 101-SY. It has been determined that use of the wands will influence tank dome pressures as a function of ventilation system configuration, spray drop size, rinse water temperature, and rate at which spraywand flows are established.

1398 (WHC-SD-WM-ES-336) Hanford transuranic analytical capability. McVey, C.B. Westinghouse Hanford Co., Richland, WA (United States). 24 Feb 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008418. Source: OSTI; NTIS; INIS; GPO Dep.

With the current DOE focus on ER/WM programs, an increase in the quantity of waste samples that requires detailed analysis is forecasted. One of the prime areas of growth is the demand for DOE environmental protocol analyses of TRU waste samples. Currently there is no laboratory capacity to support analysis of TRU waste samples in excess of 200 nCi/gm. This study recommends that an interim solution be undertaken to provide these services. By adding two glove boxes in room 11A of 222S the interim waste analytical needs can be met for a period of four to five years or until a front end facility is erected at or near the 222-S facility. The yearly average of samples is projected to be approximately 600 samples. The figure has changed significantly due to budget changes and has been downgraded from 10,000 samples to the 600 level. Until these budget and sample projection changes become firmer, a long term option is not recommended at this time. A revision to this document is recommended by March 1996 to review the long term option and sample projections.

1399 (WHC-SD-WM-ES-340) High Level Waste plant operation and maintenance concepts. Final report, March 27, 1995. Janicek, G.P. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., NM (United States); BNFL, Inc., Richland, WA (United States). 11 Apr 1995. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010809. Source: OSTI; NTIS; INIS; GPO Dep.

The study reviews and evaluates worldwide High Level Waste (HLW) vitrification operating and maintenance (O&M) philosophies, plant design concepts, and lessons learned with an aim towards developing O&M recommendations for either, similar implementation or further consideration in a

HLW vitrification facility at Hanford. The study includes a qualitative assessment of alternative concepts for a variety of plant and process systems and subsystems germane to HLW vitrification, such as, feed materials handling, melter configuration, glass form, canister handling, failed equipment handling, waste handling, and process control. Concept evaluations and recommendations consider impacts to Capital Cost, O&M Cost, ALARA, Availability, and Reliability.

1400 (WHC-SD-WM-ES-349) Nitrate stress corrosion crack growth rate in plain carbon steels. Blackburn, L.D. Westinghouse Hanford Co., Richland, WA (United States). 3 May 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011689. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes information from the published literature related to the rate of growth of stress corrosion cracks in aqueous solution containing nitrate ions. A simple model for crack growth calculations in waste tanks is suggested.

1401 (WHC-SD-WM-ETP-058) Engineering task plan for BX/BY compressor upgrade. Strand, R.G. Westinghouse Hanford Co., Richland, WA (United States). 7 Feb 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007792. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan outlines the remaining work to be completed for the BX/BY Instrument Air upgrade. Initial work efforts were guided by Engineering Work Plan, "BX-BY Compressor Upgrade" dated 1-25-93 (see Attachment A) which is provided for information. The overall engineering task is to provide a permanent replacement for the instrument air supply system for the 241-BX/BY Tank Farms. The existing system consists of a 25 horsepower Worthington non-lube compressor and an Oriad air dryer. The existing equipment is dated, requires high maintenance and is located in a contaminated zone making it unusable. The BX/BY instrument air replacement unit will be one of the 100 SCFM generic air stations. This station will be permanently sited with the addition of drawing changes to provide a concrete foundation, air piping to existing lines and electrical power supply tie-ins.

1402 (WHC-SD-WM-ETP-0106) In situ sampling device development engineering task plan. DeFord, D.K. Westinghouse Hanford Co., Richland, WA (United States). 7 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002236. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering task plan (ETP) supports the development for facility use of an improved packaging method or device for the sorbent media used during in situ sampling of waste tanks. Improvement is being sought due to problems with internal and external radioactive contamination. In situ sampling refers to placing sample collection media (primarily sorbent tubes) directly into the tank headspace, then drawing tank gases through the collection media to obtain samples. Development for facility use, includes design, fabrication, and formal documentation of the device. As the most important change to be made is addition of a High Efficiency Particulate Air (HEPA) filter, the device will be referred to in this ETP as the Filter Device or simply the Device. This ETP is intended to be the management plan governing the design, fabrication, and formal documentation

of the Filter Device. This plan identifies the engineering services and other resources to accomplish that purpose. The design basis for the development of the Device is presented in this ETP.

1403 (WHC-SD-WM-ETP-107) Engineering task plan for the vapor monitor installation into 241-C-103 tank. Hertelendy, N.A. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006895. Source: OSTI; NTIS; INIS; GPO Dep.

A vapor flow monitor is to be installed into the 241-C-103 tank's exhaust, just downstream of the HEPA filter. The flow monitor system includes the flow sensor, the baffle assembly, the signal conditioning and control electronics, and a chart recorder. The electronics package and the chart recorder are installed into a small, heated instrument cabinet that is mounted on the same steel pallet on which the flowmeter and the diffuser assembly is mounted. The flowmeter is connected to the HEPA filter with an unheated, un-insulated flex hose. An automatic drain, upstream of the flowmeter, is designed to automatically drain the condensate into an evaporating pan. The flowmeter is heated with a temperature controlled heater to avoid condensation.

1404 (WHC-SD-WM-ETP-113) Engineering task plan for tank farm ventilation strategy document preparation and maintenance. VanderZanden, M.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000716. Source: OSTI; NTIS; INIS; GPO Dep.

Active and passive systems provide ventilation for single shell tanks (SST), double shell tanks (DST), and doubly contained receiver tanks (DCRT). The systems perform or contribute to one or more of the following functions: maintain structural integrity (prevent overpressurization), confinement, cooling, vapor and gas removal, and leak detection. For certain tanks, ventilation also removes particles, in addition to vapors, to permit visual observation of the tank inner walls and waste surface. The function(s) performed are dependent on tank construction, watchlist classification, and tank contents. The function(s) should be maintained to support the TWRS mission. The tank farm mission is expected to extend to 2028, based on Tri-Party Agreement (TPA) milestone, M-50-00, for completion of waste pretreatment. Many systems are currently beyond service life expectations and continued operation will result in decreased reliability and increased maintenance. Therefore, the systems must be replaced or upgraded to ensure adequate reliability. Ventilation system upgrades are included in a capital Project W-314, Tank Farm Restoration and Safe Operations. The ventilation upgrades are expected to be completed by June 2002. The new ventilation systems will satisfy the required function(s) of the tanks and/or tank farms. However, interim component upgrades may be required to guarantee reliability of systems until the capital project is completed. Some upgrades originally identified in the project might more suitably be provided with non-project resources.

1405 (WHC-SD-WM-ETP-115) Engineering Task Plan for a vapor treatment system on Tank 241-C-103. Conrad, R.B. Westinghouse Hanford Co., Richland, WA (United States). 9 Mar 1995. 24p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009146. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan describes tasks and responsibilities for the design, fabrication, test, and installation of a vapor treatment system (mixing system) on Tank 241-C-103. The mixing system is to be installed downstream of the breather filter and will use a mixing blower to reduce the chemical concentrations to below allowable levels.

1406 (WHC-SD-WM-ETP-118) Engineering task plan for Tanks 241-AN-103, 104, 105 color video camera systems. Kohlman, E.H. Westinghouse Hanford Co., Richland, WA (United States). 17 Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004149. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan (ETP) describes the design, fabrication, assembly, and installation of the video camera systems into the vapor space within tanks 241-AN-103, 104, and 105. The one camera remotely operated color video systems will be used to observe and record the activities within the vapor space. Activities may include but are not limited to core sampling, auger activities, crust layer examination, monitoring of equipment installation/removal, and any other activities. The objective of this task is to provide a single camera system in each of the tanks for the Flammable Gas Tank Safety Program.

1407 (WHC-SD-WM-ETP-119) Engineering task plan and status of 241-S-106 Enraf level gauge wire break. Moore, T.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001038. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the findings of a task team which was formed which identified the need for short-term actions to re-establish tank waste level monitoring and to permanently address wire failure. The failed wire was removed and sent to Pacific Northwest Laboratory (PNL) for analysis. It was determined that the cause of the wire failure was due to chloride ion stress corrosion cracking (SCC) of the 316 stainless steel (SS) wire. Radiation induced breakdown of the polyvinyl chloride (PVC) riser liners is suspected to be the source of the chloride ions.

1408 (WHC-SD-WM-ETP-122) Engineering task plan for steam line ramp calculations. DeSantis, G.N.; Freeman, R.D. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002076. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide an approved work plan to perform calculations that verify the load limits of a proposed ramp over a steam line at the back side (East side) of SY Farm in support of work package 2W-94-00812/K. The objective of this supporting document is to provide Operations with a set of checked calculations that verify the ramp over the steam line at SY Farm will support a fully loaded concrete mixer truck without affecting the steam line. The calculations will be performed by an engineers from Facility Systems and independently checked and reviewed by another engineer. The calculations may then be added to the work package. If Operations decides to make any configuration changes to the steam line or surrounding area,

Operations shall have these changes documented by an Engineering Change Notice (ECN). This ECN can be done by Facility Systems or any other engineering organization at the direction of Operations.

1409 (WHC-SD-WM-ETP-125) Engineering task plan for Enraf Nonius densitometer assembly design. Elfner, E.G. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005218. Source: OSTI; NTIS; INIS; GPO Dep.

A supporting assembly will be designed to accommodate the Enraf Nonius densitometer. The design will include a sight glass or calibration chamber, a rinse spool assembly, and a ball valve. The assembly will be based on the Enraf Nonius liquid level gauge assembly.

1410 (WHC-SD-WM-ETP-128) FY 95 engineering work plan for the design reconstitution implementation action plan. Bigbee, J.D. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003771. Source: OSTI; NTIS; INIS; GPO Dep.

Design reconstitution work is to be performed as part of an overall effort to upgrade Configuration Management (CM) at TWRS. WHC policy is to implement a program that is compliant with DOE-STD-1073-93, Guide for Operational Configuration Management Program. DOE-STD-1073 requires an adjunct program for reconstituting design information. WHC-SD-WM-CM-009, Design Reconstitution Program Plan for Waste Tank Farms and 242-A Evaporator of Tank Waste Remediation System, is the TWRS plan for meeting DOE-STD-1073 design reconstitution requirements. The design reconstitution plan is complex requiring significant time and effort for implementation. In order to control costs, and integrate the work into other TWRS activities, a Design Reconstitution Implementation Action Plan (DR IAP) will be developed, and approved by those organizations having ownership or functional interest in this activity.

1411 (WHC-SD-WM-ETP-129) FY 95 engineering work plan to develop grading criteria for configuration management and design reconstitution. Bigbee, J.D. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003768. Source: OSTI; NTIS; INIS; GPO Dep.

This is an engineering work plan to develop grading criteria for configuration management and design reconstitution.

1412 (WHC-SD-WM-ETP-135) Engineering task plan for flammable gas atmosphere mobile color video camera systems. Kohlman, E.H. Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006906. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan (ETP) describes the design, fabrication, assembly, and testing of the mobile video camera systems. The color video camera systems will be used to observe and record the activities within the vapor space of a tank on a limited exposure basis. The units will be fully mobile and designed for operation in the single-shell flammable gas producing tanks. The objective of this task is to provide two mobile camera systems for use in flammable gas producing single-shell tanks (SSTs) for the Flammable

Gas Tank Safety Program. The camera systems will provide observation, video recording, and monitoring of the activities that occur in the vapor space of applied tanks. The camera systems will be designed to be totally mobile, capable of deployment up to 6.1 meters into a 4 inch (minimum) riser.

1413 (WHC-SD-WM-ETP-137) Recommended test program to determine crack growth rate in double-shell tank materials. Blackburn, L.D. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 10p. DOE Contract AC06-87RL10930. Order Number DE95009098. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the technical rationale and requirements for an experimental program to determine the stress corrosion crack growth rate in double-shell tank materials.

1414 (WHC-SD-WM-ETP-138) In situ sampling cart development engineering task plan. DeFord, D.K. Westinghouse Hanford Co., Richland, WA (United States). 6 Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007174. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan (ETP) supports the development for facility use of the next generation in situ sampling system for characterization of tank vapors. In situ sampling refers to placing sample collection devices (primarily sorbent tubes) directly into the tank headspace, then drawing tank gases through the collection devices to obtain samples. The current in situ sampling system is functional but was not designed to provide the accurate flow measurement required by today's data quality objectives (DQOs) for vapor characterization. The new system will incorporate modern instrumentation to achieve much tighter control. The next generation system will be referred to in this ETP as the New In Situ System (NISS) or New System. The report describes the current sampling system and the modifications that are required for more accuracy.

1415 (WHC-SD-WM-ETP-143) TWRS hydrogen mitigation gas characterization system design and fabrication engineering task plan. Straalsund, E.K. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008411. Source: OSTI; NTIS; INIS; GPO Dep.

The flammable gas watch-list (FGWL) tanks, which have demonstrated a gas release event (GRE) exceeding 0.625% hydrogen by volume will require additional characterization. The purpose of this additional characterization is to accurately measure the flammable and hazardous gas compositions and resulting lower flammability limit (LFL) of the tank vapor space during baseline and GRE emissions. Data from this characterization will help determine methods to resolve the unreviewed safety questions for the FGWL tanks. This document details organization responsibilities and engineering requirements for the design and fabrication of two gas characterization systems used to monitor flammable gas watch-list tanks.

1416 (WHC-SD-WM-ETP-146) Engineering Task Plan: PUREX cathodic protection system survey and maintenance. Brezler, T.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010049. Source: OSTI; NTIS; INIS; GPO Dep.

Cathodic Protection (CP) was installed on underground transfer lines at the PUREX facility by project B-234 by EBASCO Services Incorporated in 1986. The major components of the CP system are rectifier 02, a series of underground anodes, test stations and reference electrodes buried close to the protected piping. Tank Waste Remediation System (TWRS) Materials and Corrosion Engineering (M&CE) was asked by PUREX to assume responsibility for surveying and maintaining PUREX's CP system. The effectiveness of CP will remain so if properly maintained, which requires periodic measurements and timely corrective action when the measurements show loss of CP. If the system is not well maintained, corrosion failures will eventually occur on the piping protected by the CP system. This engineering task plan establishes an agreement between PUREX and TWRS M&CE to ensure proper operation of the CP system and adherence to the Washington Administrative Codes (WAC).

1417 (WHC-SD-WM-ETP-148) Engineering Task Plan for inspection of double shell tank farm exhaust ducts. Nelson, O.D. Westinghouse Hanford Co., Richland, WA (United States). 27 Mar 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010058. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the scope and tasks required to determine the integrity of selected double shell tank exhaust ducts.

1418 (WHC-SD-WM-ETP-150) TWRS system drawings and field verification. Shepard, D.G. Westinghouse Hanford Co., Richland, WA (United States). 11 Apr 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010587. Source: OSTI; NTIS; INIS; GPO Dep.

The Configuration Management Program combines the TWRS Labeling and O and M drawing and drawing verification programs. The combined program will produce system drawings for systems that are normally operated or have maintenance performed on the system, label individual pieces of equipment for proper identification, even if system drawings are not warranted, and perform verification of drawings that are identified as essential in Tank Farm Essential Drawing Plans. During fiscal year 1994, work was begun to label Tank Farm components and provide user friendly system based drawings for Tank Waste Remediation System (TWRS) operations and maintenance. During the first half of fiscal 1995, the field verification program continued to convert TWRS drawings into CAD format and verify the accuracy based on visual inspections. During the remainder of fiscal year 1995 these efforts will be combined into a single program providing system based drawings and field verification of TWRS equipment and facilities. This combined program for TWRS will include all active systems for tank farms. Operations will determine the extent of drawing and labeling requirements for single shell tanks, i.e. the electrical distribution, HVAC, leak detection, and the radiation monitoring system. The tasks required to meet these objectives, include the following: identify system boundaries or scope for drawing being verified; label equipment/components in the process systems with a unique Equipment Identification Number (EIN) per the TWRS Data Standard; develop system drawings that are coordinated by "smart" drawing numbers and/or drawing references as identified on H-14-020000; develop a Master Equipment List (MEL) multi-user data base application which will contain

key information about equipment identified in the field; and field verify and release TWRS Operation and Maintenance (O and M) drawings.

1419 (WHC-SD-WM-EV-053-Rev.2) Double shell tank waste analysis plan. Mulkey, C.H.; Jones, J.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005079. Source: OSTI; NTIS; INIS; GPO Dep.

Waste analysis plan for the double shell tanks. SD-WM-EV-053 is Superseding SD-WM-EV-057. This document provides the plan for obtaining information needed for the safe waste handling and storage of waste in the Double Shell Tank Systems. In Particular it addresses analysis necessary to manage waste according to Washington Administrative Code 173-303 and Title 40, parts 264 and 265 of the Code of Federal Regulations.

1420 (WHC-SD-WM-EV-098) Inventory of Tank Farm equipment stored or abandoned aboveground. Hines, S.C.; Lakes, M.E. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 334p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002098. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an inventory of Tank Farm equipment stored or abandoned aboveground and potentially subject to regulation. This inventory was conducted in part to ensure that Westinghouse Hanford Company (WHC) does not violate dangerous waste laws concerning storage of potentially contaminated equipment/debris that has been in contact with dangerous waste. The report identifies areas inventoried and provides photographs of equipment.

1421 (WHC-SD-WM-FDC-031) Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1). Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002160. Source: OSTI; NTIS; INIS; GPO Dep.

Early in 1990, the potential for a large quantity of hydrogen and nitrous oxide to exist as an explosive mixture within some Hanford waste tanks was declared an unreviewed safety question. The waste tank safety task team was established at that time to carry out safety evaluations and plan the means for mitigating this potential hazard. Action was promptly taken to identify those tanks with the highest hazard and to implement interim operating requirements to minimize ignition sources.

1422 (WHC-SD-WM-FDC-032) Tank SY-101 void fraction instrument functional design criteria. McWethy, L.M. Westinghouse Hanford Co., Richland, WA (United States). 18 Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002159. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the functional design criteria for design, analysis, fabrication, testing, and installation of a void fraction instrument for Tank SY-101. This instrument will measure the void fraction in the waste in Tank SY-101 at various elevations.

1423 (WHC-SD-WM-FDC-036) Spare mitigation/retrieval mixer pumps. Taylor, S. Westinghouse Hanford

Co., Richland, WA (United States). 2 Feb 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006784. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the functional design criteria for design, analysis, fabrication, testing, and installation of a waste tank mixer pump. The mixer pump will be operated to eliminate the periodic releases of large quantities of flammable gas (e.g., hydrogen) from Hanford Site waste tanks and also to accommodate retrieval of tank waste.

1424 (WHC-SD-WM-FDC-036-Rev.1) Spare mitigation/retrieval mixer pump: Functional design criteria. Revision 1. Andres, B. Westinghouse Hanford Co., Richland, WA (United States). 20 Mar 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010095. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the functional design criteria for design, analysis, fabrication, testing and installation of a waste tank mixer pump. The mixer pump will be operated to eliminate the periodic release of flammable gas (e.g. hydrogen) from Hanford Site waste tanks. A secondary objective is to accommodate waste retrieval as much as practical without designing a full retrieval pump.

1425 (WHC-SD-WM-FDC-041) Gas characterization system functional design criteria. Straalsund, E.K. Westinghouse Hanford Co., Richland, WA (United States). 5 Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005228. Source: OSTI; NTIS; INIS; GPO Dep.

This is the functional design criteria for the gas characterization systems being placed on selected flammable gas watch-list tanks in support of the hydrogen mitigation tests.

1426 (WHC-SD-WM-FDC-042) Liquid Observation Well (LOW) Functional Design. Paul, B. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005601. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the Functional Design Criteria for installing Liquid Observation Wells (LOWs) into single-shell tanks containing either ferrocyanide or organic waste. The LOWs will be designed to accommodate the deployment of gamma, neutron, and electromagnetic induction probes and to interface with the existing tank structure and environment.

1427 (WHC-SD-WM-FHA-005) Fire hazard analysis for leachate tank enclosure 200 West Area/218-W-5 burial ground. McDonald, K.M. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003085. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an analysis of potential fire and explosion hazards associated with enclosing the leachate tank of W-025 mixed waste trench. It addresses the requirements of DOE Order 5480.7A for fire hazards analysis. Fire potential was shown to be minimal. Organics and hydrogen generation in the leachate are of little or no concern. The maximum possible fire loss is concluded to be less than \$5,000 and involve no radioactive material. The analysis recommended applying for a waiver to the requirement to install sprinkler systems.

1428 (WHC-SD-WM-FRD-019) Functions and requirements for single-shell tank leakage mitigation. Cruse, J.M. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1994. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001561. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the initial functions and requirements for the leakage mitigation mission applicable to past and potential future leakage from the Hanford Site's 149 single-shell high-level waste tanks. This mission is a part of the overall mission of the Westinghouse Hanford Company Tank Waste Remediation System division to remediate the tank waste in a safe and acceptable manner. Systems engineering principles are being applied to this effort. A Mission Analysis has been completed, this document reflects the next step in the systems engineering approach to decompose the mission into primary functions and requirements. The functions and requirements in this document apply to mitigative actions to be taken regarding below ground leaks from SST containment boundaries and the resulting soil contamination. Leakage mitigation is invoked in the TWRS Program in three fourth level functions: (1) Store Waste, (2) Retrieve Waste, and (3) Disposition Excess Facilities.

1429 (WHC-SD-WM-HC-014) Electrical classification for the single shell flammable gas watch list tanks. Huckfeldt, R.A.; Anderson, R.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010060. Source: OSTI; NTIS; INIS; GPO Dep.

This document is to establish the hazard classification of single shell watch list tanks according to National Fire Protection Association (NFPA) criteria and sound engineering judgment. Establishing the hazard classification is necessary to determine the appropriate wiring methods and installation of electrical and mechanical equipment assure safety in an atmosphere that may be hazardous. The tanks have been placed on the flammable gas watch list because their waste types are similar to those in tanks that exhibit episodic behavior and/or unexplained growth of the waste-level height occurring over time. They contain mostly solid wastes.

1430 (WHC-SD-WM-HIE-003) Safety basis for the 241-AN-107 mixer pump installation and caustic addition. Van Vleet, R.J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Wastren, Inc., Idaho Falls, ID (United States). 5 Oct 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002281. Source: OSTI; NTIS; INIS; GPO Dep.

This safety Basis was prepared to determine whether or not the proposed activities of installing a 76 HP jet mixer pump and the addition of approximately 50,000 gallons of 19 M (50:50 wt %) aqueous caustic are within the safety envelope as described by Tank Farms (chapter six of WHC-SD-WM-ISB-001, Rev. 0). The safety basis covers the components, structures and systems for the caustic addition and mixer pump installation. These include: installation of the mixer pump and monitoring equipment; operation of the mixer pump, process monitoring equipment and caustic addition; the pump stand, caustic addition skid, the electrical skid, the video camera system and the two densitometers. Also covered is the removal and decontamination of the mixer pump and process monitoring system. Authority for

this safety basis is WHC-IP-0842 (Waste Tank Administration). Section 15.9, Rev. 2 (Unreviewed Safety Questions) of WHC-IP-0842 requires that an evaluation be performed for all physical modifications.

1431 (WHC-SD-WM-HSP-002-Rev.2) Tank farm health and safety plan. Revision 2. Mickle, G.D. Westinghouse Hanford Co., Richland, WA (United States). 29 Mar 1995. 493p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010092. Source: OSTI; NTIS; INIS; GPO Dep.

This Tank Farm Health and Safety Plan (HASP) for the conduct of all operations and work activities at the Hanford Site 200 Area Tank Farms is provided in order to minimize health and safety risks to workers and other onsite personnel. The HASP accomplishes this objective by establishing requirements, providing general guidelines, and conveying farm and facility-specific hazard communication information. The HASP, in conjunction with the job-specific information required by the HASP, is provided also as a reference for use during the planning of work activities at the tank farms. This HASP applies to Westinghouse Hanford Company (WHC), other prime contractors to the U.S. Department of Energy (DOE), and subcontractors to WHC who may be involved in tank farm work activities. This plan is intended to be both a requirements document and a useful reference to aid tank farm workers in understanding the safety and health issues that are encountered in routine and nonroutine work activities. The HASP defines the health and safety responsibilities of personnel working at the tank farms. It has been prepared in recognition of and is consistent with National Institute of Safety and Health (NIOSH), and Occupational Safety and Health Administration (OSHA)/Unlimited State Coast Guard (USCG)/U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH 1985); WHC-CM-4-3, Industrial Safety Manual, Volume 4, "Health and Safety Programs for Hazardous Waste Operations;" 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response; WHC-CM-1-1, Management Policies; and WHC-CM-1-3, Management Requirements and Procedures. When differences in governing regulations or policies exist, the more stringent requirements shall apply until the discrepancy can be resolved.

1432 (WHC-SD-WM-LL-006) 241-SY-101 air lance removal lessons learned. Moore, T.L.; Titzler, P.A. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002279. Source: OSTI; NTIS; INIS; GPO Dep.

An emergency task was undertaken to remove four air lances and one thermocouple (TC) tree from tank 241-SY-101 (SY-101). This resulted from video observation that these pipes were being severely bent during periodic gas release events that regularly occurred every three to four months. At the time, the gas release events were considered to be the number one safety issue within the US Department of Energy (DOE) complex. This emergency removal task was undertaken on an extremely short schedule that required all activities possible to be completed in parallel. This approach and extremely short schedule, while successful, resulted in some undesirable consequences from less than desired time for design, reviews, equipment testing, operations training, and bad weather conditions. These consequences included leakage of liquid waste from the containers to the ground, higher than expected dose

rates at the container surface, difficult field operations, and unexpected pipe configuration during removal. In addition, changes to environmental regulations and severe winter weather impacted the packaging and shipping activities required to prepare the removed pipes for storage at the Central Waste Complex (CWC). The purpose of this document is to identify lessons to be learned for future activities. In context of the emergency conditions that existed at the time and the urgency to remove these pipes, their removal was successfully completed under extremely difficult conditions and schedule. The success of the task should not be overshadowed by the desire to identify areas needing improvement and lessons to be learned. Many of the lessons identified in this document have already resulted in improved conduct of operations and engineering.

1433 (WHC-SD-WM-MAR-001) Mission analysis report for single-shell tank leakage mitigation. Cruse, J.M. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019055. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an analysis of the leakage mitigation mission applicable to past and potential future leakage from the Hanford Site's 149 single-shell high-level waste tanks. This mission is a part of the overall missions of the Westinghouse Hanford Company Tank Waste Remediation System division to remediate the tank waste in a safe and acceptable manner. Systems engineers principles are being applied to this effort. Mission analysis supports early decision making by clearly defining program objectives. This document identifies the initial conditions and acceptable final conditions, defines the programmatic and physical interfaces and constraints, estimates the resources to carry out the mission, and establishes measures of success. The results of the mission analysis provide a consistent basis for subsequent systems engineering work.

1434 (WHC-SD-WM-OMM-015) Standard hydrogen monitoring system-B operation and maintenance manual. Bender, R.M. Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007188. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide information for the operation and maintenance of the Standards Hydrogen Monitoring System-B (SHMS-B) used in the 200E and 200W area tank farms on the Hanford site. This provides information specific to the mechanical operation of the system and is not intended to take the place of a Plant Operating Procedure. The primary function of the SHMS-B is to monitor specifically for hydrogen in the waste tank vapor space which may also contain unknown quantities of other gaseous constituents.

1435 (WHC-SD-WM-OMM-016) Operational and maintenance manual, 100 ton hydraulic trailer. Koons, B.M. Westinghouse Hanford Co., Richland, WA (United States). 3 Mar 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008894. Source: OSTI; NTIS; INIS; GPO Dep.

The 100 ton hydraulic trailer is used to remove the mitigation pump from Tank 241SY101. This manual explains how to inspect, operate, and maintain the trailer in a state of readiness.

1436 (WHC-SD-WM-OTP-151) Operability test procedure for 241-U compressed air system and heat pump. Freeman, R.D. Westinghouse Hanford Co., Richland, WA (United States). 31 Aug 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000503. Source: OSTI; NTIS; INIS; GPO Dep.

The 241-U-701 compressed air system supplies instrument quality compressed air to Tank Farm 241-U. The supply piping to the 241-U Tank Farm is not included in the modification. Modifications to the 241-U-701 compressed air system include installation of a 15 HP Reciprocating Air Compressor, Ingersoll-Rand Model 10T3NLM-E15; an air dryer, Hankinson, Model DH-45; and miscellaneous system equipment and piping (valves, filters, etc.) to meet the design. A newly installed heat pump allows the compressor to operate within an enclosed relatively dust free atmosphere and keeps the compressor room within a standard acceptable temperature range, which makes possible efficient compressor operation, reduces maintenance, and maximizes compressor operating life. This document is an Operability Test Procedure (OTP) which will further verify (in addition to the Acceptance Test Procedure) that the 241-U-701 compressed air system and heat pump operate within their intended design parameters. The activities defined in this OTP will be performed to ensure the performance of the new compressed air system will be adequate, reliable and efficient. Completion of this OTP and sign off of the OTP Acceptance of Test Results is necessary for turnover of the compressed air system from Engineering to Operations.

1437 (WHC-SD-WM-OTP-158) Acceptance/operational test procedure 101-SY tank camera purge system and in tank color camera video imaging system. Werry, S.M. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000344. Source: OSTI; NTIS; GPO Dep.

This Acceptance/Operational Test Procedure will document the satisfactory operation of the 101-SY color camera purge control system and color camera video imaging system.

1438 (WHC-SD-WM-OTP-159) Acceptance/operational test procedure 101-AW tank camera purge system and 101-AW video camera system. Castleberry, J.L. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000717. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure will document the satisfactory operation of the 101-AW Tank Camera Purge System (CPS) and the 101-AW Video Camera System. The safety interlock which shuts down all the electronics inside the 101-AW vapor space, during loss of purge pressure, will be in place and tested to ensure reliable performance. This procedure is separated into four sections. Section 6.1 is performed in the 306 building prior to delivery to the 200 East Tank Farms and involves leak checking all fittings on the 101-AW Purge Panel for leakage using a Snoop solution and resolving the leakage. Section 7.1 verifies that PR-1, the regulator which maintains a positive pressure within the volume (cameras and pneumatic lines), is properly set. In addition the green light (PRESSURIZED) (located on the Purge Control Panel)

is verified to turn on above 10 in. w.g. and after the time delay (TDR) has timed out. Section 7.2 verifies that the purge cycle functions properly, the red light (PURGE ON) comes on, and that the correct flowrate is obtained to meet the requirements of the National Fire Protection Association. Section 7.3 verifies that the pan and tilt, camera, associated controls and components operate correctly. This section also verifies that the safety interlock system operates correctly during loss of purge pressure. During the loss of purge operation the illumination of the amber light (PURGE FAILED) will be verified.

1439 (WHC-SD-WM-OTP-161) **Acceptance/operational test procedure 103-SY tank camera purge control system.** Castleberry, J.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004422. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance/Operational Test Procedure will document the satisfactory operation of the 103-SY Camera Purge Control System.

1440 (WHC-SD-WM-OTP-163) **Operability test procedure for 211BA flow proportional sampler.** Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003996. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this operability test procedure (OTP) is to verify the 211-BA flow proportional sampler system and components function correctly as intended by design. System test will include the sampling system, all associated instrumentation, and Facility Process Monitor and Control System (FPMCS). The combined chemical sewer stream from B Plant flows through sump 211BA-SMP-01 located in 211-BA and is continuously monitored for gamma and beta radiation and pH. 211-BA has been upgraded to include a flow proportional sampler. A specified sample volume will be withdrawn at programmed intervals from the 211BA sump and deposited in a 19 liter plastic carboy. The sampler will be programmed per the vendor installation and operations manual by B Plant instrument maintenance personnel. Samples will be taken during five consecutive sample cycles with the sample volumes and sample frequencies recorded for comparison purposes. Additional tests related to the sampler include the alarm circuitry for loss of power and failure to obtain sample.

1441 (WHC-SD-WM-OTP-164) **Operability test procedure for the Waste Information and Control System.** Flynn, D.F. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003164. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the operability test procedure for the WICS. The Westinghouse Hanford Company (WHC) Hazardous Material Control Group (HMC) of the 222-S Laboratory has requested the development of a system to help resolve many of the difficulties associated with tracking and data collection of containers and drums of waste. This system has been identified as Waste Information and Control System (WICS). The request for developing and implementing WICS has been made to the Automation and Simulation Engineering Group (ASE).

1442 (WHC-SD-WM-OTP-165) **Acceptance/operational test procedure 241-AN-107 Video Camera System.** Pedersen, L.T. Westinghouse Hanford Co., Richland, WA (United States). 18 Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003997. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure will document the satisfactory operation of the 241-AN-107 Video Camera System. The camera assembly, including camera mast, pan-and-tilt unit, camera, and lights, will be installed in Tank 241-AN-107 to monitor activities during the Caustic Addition Project. The camera focus, zoom, and iris remote controls will be functionally tested. The resolution and color rendition of the camera will be verified using standard reference charts. The pan-and-tilt unit will be tested for required ranges of motion, and the camera lights will be functionally tested. The master control station equipment, including the monitor, VCRs, printer, character generator, and video micrometer will be set up and performance tested in accordance with original equipment manufacturer's specifications. The accuracy of the video micrometer to measure objects in the range of 0.25 inches to 67 inches will be verified. The gas drying distribution system will be tested to ensure that a drying gas can be flowed over the camera and lens in the event that condensation forms on these components. This test will be performed by attaching the gas input connector, located in the upper junction box, to a pressurized gas supply and verifying that the check valve, located in the camera housing, opens to exhaust the compressed gas. The 241-AN-107 camera system will also be tested to assure acceptable resolution of the camera imaging components utilizing the camera system lights.

1443 (WHC-SD-WM-OTP-167) **Caustic addition system operability test procedure.** Parazin, R.E. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004501. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure provides instructions for performing operational testing of the major components of the 241-AN-107 Caustic Addition System by WHC and Kaiser personnel at the Rotating Equipment Shop run-in pit (Bldg. 272E).

1444 (WHC-SD-WM-OTP-168) **Operability test procedure [Tank] 241-SY-101 equipment removal system.** Mast, J.C. Westinghouse Hanford Co., Richland, WA (United States). 8 Dec 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004751. Source: OSTI; NTIS; INIS; GPO Dep.

The 241-SY-101 equipment removal system (ERS) consists of components, equipment, instrumentation and procedures that will provide the means to disconnect, retrieve, contain, load and transport the Mitigation Pump Assembly (MPA) from waste Tank 241-SY-101 to the Central Waste Complex (CWC). The Operability Test Procedure (OTP) will test the interfaces between ERS components and will rehearse the procedure for MPA removal and transportation to the extent they can be mocked-up at the CTF (Cold Test Facility). At the conclusion of the OTP, the ERS components and equipment will be removed from the CTF, entered into the Component Based Recall System (CBRS), and stored until needed for actual MPA removal and transportation.

1445 (WHC-SD-WM-OTR-148) Operability Test Report for 241-T compressed air system and heat pump. Freeman, R.D. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010072. Source: OSTI; NTIS; INIS; GPO Dep.

This Operability Test Report (OTR) documents the results of functional testing performed on the operating parameters of the 241-T-701 Compressed Air System. The System was successfully installed and tested per work package 2W-92-01172.

1446 (WHC-SD-WM-OTR-151) Operability Test Report for 241-U Compressed Air System and heat pump. Rensink, G.E. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010141. Source: OSTI; NTIS; INIS; GPO Dep.

The 241-U-701 compressed air system supplies instrument quality compressed air to Tank Farm 241-U. The system was upgraded. The operability test showed that the system operates within its intended design parameters. System performance was monitored, recorded, and used to identify areas of concern. Exceptions to the OTP and additional items for safe system performance were minimal and have been resolved; the air system is ready for Operation's use.

1447 (WHC-SD-WM-OTR-153) Acceptance/operational test report 103-SY and 101-SY tank camera purge system and 103-SY video camera system. Castleberry, J.L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003252. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance/Operational Test Report will document the satisfactory operation of the 103-SY/101-SY Purge Control System and the 103-SY Video Camera System after installation into riser 5B of tank 241-SY-103.

1448 (WHC-SD-WM-OTR-155) Operational test report for WESF diesel generator diesel tank installation. Schwehr, B.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003282. Source: OSTI; NTIS; INIS; GPO Dep.

The WESF Backup Generator Underground Diesel Tank 101 has been replaced with a new above ground 1000 gallon diesel tank. Following the tank installation, inspections and tests specified in the Operational Test Procedure, WHC-SD-WM-OTP-155, were performed. Inspections performed by a Quality Control person indicated the installation was leak free and the diesel generator/engine ran as desired. There were no test and inspection exceptions, therefore, the diesel tank installation is operable.

1449 (WHC-SD-WM-PAP-60) TWRS corrosion monitoring program plan. Lindsay, D.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002368. Source: OSTI; NTIS; INIS; GPO Dep.

This plan is for the compilation of existing relevant corrosion data, the generation of current corrosion data by monitoring present conditions in the Hanford waste tank

systems, and the development of methods to control corrosion on the Hanford site.

1450 (WHC-SD-WM-PC-002-Rev.6) Tank farms essential and support drawing plan. Revision 6. Salazar, B.E. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002211. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides a detailed list of the essential and support drawings selected for the tank farm(s) and associated facilities.

1451 (WHC-SD-WM-PCP-009) Process control plan for 242-A Evaporator Campaign 94-2. Le, E.Q. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000341. Source: OSTI; NTIS; INIS; GPO Dep.

242-A Evaporator Campaign 94-2 will process approximately 3.42 million gallons of dilute waste from tanks 101-AP, 107-AP, 108AP, 102-AW, and 106-AW. The process control plan describes activities which will occur during Campaign 94-2. This document also addresses compliance with the tank farm waste compatibility program, the 242-A radiological source term, the criticality prevention specifications, and effluent discharge limits.

1452 (WHC-SD-WM-PE-053) 242-A Campaign 94-1 post run document. Guthrie, M.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001631. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this post-run document is to summarize the results of 242-A Evaporator Campaign 94-1 as required. Campaign 94-1 represents the first Evaporator operation since 1989, following completion of the B-534 upgrades and Liquid Effluent Retention Facility (LERF) construction. The purpose of Campaign 94-1 was to concentrate dilute waste from TK-102-AW, TK-106-AW, and TK-103-AP. From an available 2.87 million gallon feedstock of dilute waste contained in 102-AW, 106-AW and 103-AP, an overall Waste Volume Reduction (WVR) of 2.39 million gallons (83% WVR) was achieved. At the completion of the campaign, approximately 477,000 gallons of dilute double-shell slurry feed (DDSSF) was produced with a SpG. of 1.25-1.30. Total process condensate discharged to LERF was 3.09 million gallons, achieving a condensate/WVR ratio of 1.29. Throughput for Campaign 94-1 was 5.27 million gallons. Total steam condensate and cooling water discharge to B-pond was 4.7 and 216 million gallons respectively. The evaporator operated approximately 43 days of the 60 day campaign for a total operating efficiency of 73%. Campaign 94-1 was completed without any discharge limit, Operating Specification Document, or Operational Safety Requirement violations. Major problems encountered during the run included the following: (1) high CA1 deentrainment pad dP's caused by foaming, (2) condensate pump P-C100 failure, and (3) ion exchange column dP's and efficiency.

1453 (WHC-SD-WM-PE-054) 242-A Campaign 94-2 post run document. Guthrie, M.D. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011663. Source: OSTI; NTIS; INIS; GPO Dep.

Campaign 94-2 was started on September 22, 1994 and finished November 19, 1994. Approximately 3.21 million gallons of dilute waste from 101-AP, 107-AP, 108-AP and tank heels from 102-AW and 106-AW were processed with an overall Waste Volume Reduction (WVR) of 2.79 million gallons (87% WVR). Slurry product generated from Campaign 94-2 consisted of 392,000 gallons of dilute double-shell slurry feed (DDSSF) with a SpG of 1.10–1.13. Total process condensate discharged to LERF was 3.45 million gallons, achieving a condensate/WVR efficiency ratio of 1.24. Total throughput for Campaign 94-2 was 5.77 million gallons. B-pond discharges from steam condensate and cooling water were 4.83 and 176 million gallons respectively. With only 68 hours of unplanned downtime, Campaign 94-2 maintained an operating efficiency of 94%.

1454 (WHC-SD-WM-PLN-072-Rev.1) Hazard communication program. Porter, E.A. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003251. Source: OSTI; NTIS; INIS; GPO Dep.

Implements Internal Publication No. WHC-IP-0914. Section 1.1, providing management and employee guidance for working with hazardous chemicals and physical agents.

1455 (WHC-SD-WM-PLN-076) Low-level waste program technical strategy. Bledsoe, K.W. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000516. Source: OSTI; NTIS; INIS; GPO Dep.

The Low-Level Waste Technical Strategy document describes the mechanisms which the Low-Level Waste Program Office plans to implement to achieve its mission. The mission is to manage the receipt, immobilization, packaging, storage/disposal and RCRA closure (of the site) of the low-level Hanford waste (pretreated tank wastes) in an environmentally sound, safe and cost-effective manner. The primary objective of the TWRS Low-level waste Program office is to vitrify the LLW fraction of the tank waste and dispose of it onsite.

1456 (WHC-SD-WM-PLN-081-Rev.3) Mixer pump long term operations plan for Tank 241-SY-101 mitigation. Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003867. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the general Operations Plan for performance of the mixer pump long term operations for Tank 241-SY-101 mitigation of gas retention and periodic release in Tank 101-SY. This operations plan will utilize a 112 kW (150 hp) mixing pump to agitate/suspend the particulates in the tank.

1457 (WHC-SD-WM-PLN-091) Tank Waste Remediation System Tank Waste Analysis Plan. FY 1995. Haller, C.S.; Dove, T.H. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010086. Source: OSTI; NTIS; INIS; GPO Dep.

This documents lays the groundwork for preparing the implementing the TWRS tank waste analysis planning and reporting for Fiscal Year 1995. This Tank Waste Characterization Plan meets the requirements specified in the Hanford

Federal Facility Agreement and Consent Order, better known as the Tri-Party Agreement.

1458 (WHC-SD-WM-PLN-092) Removal of floating organic in Hanford Waste Tank 241-C-103 restart plan. Wilson, T.R.; Hanson, C. Westinghouse Savannah River Co., Aiken, SC (United States). 3 Oct 1994. 555p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001645. Source: OSTI; NTIS; INIS; GPO Dep.

The decision whether or not to remove the organic layer from Waste Tank 241-C-103 was deferred until May, 1995. The following restart plan was prepared for removal of the organic if the decision is to remove the organic from the waste tank 241-C-103.

1459 (WHC-SD-WM-PROC-018) Assembly procedure for column cutting platform. Routh, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009150. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document describes the assembly procedure for the Column Cutting Platform and Elevation Support. The Column Cutting Platform is a component of the 241-SY-101 Equipment Removal System. It is set up on the deck of the Strongback Trailer to provide work access to cut off the upper portion of the Mitigation Pump Assembly (MPA). The Elevation Support provides support for the front of the Storage Container with the Strongback at an inclined position. The upper portion of the MPA must be cut off to install the Containment Caps on the Storage Container. The storage Container must be maintained in an inclined position until the Containment Caps are installed to prevent any residual liquids from migrating forward in the Storage Container.

1460 (WHC-SD-WM-PROC-019) Assembly procedure for Shot Loading Platform. Routh, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009153. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document describes the assembly procedure for the Shot Loading Platform. The Shot Loading Platform is used by multiple equipment removal projects to load shielding shot in the annular spaces of the equipment storage containers. The platform height is adjustable to accommodate different sizes of storage containers and transport assemblies.

1461 (WHC-SD-WM-PSE-010) Preliminary safety evaluation for 241-C-106 waste retrieval, project W-320. Conner, J.C. Westinghouse Hanford Co., Richland, WA (United States). 18 Oct 1994. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003277. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the Preliminary Safety Evaluation for Project W-320, Tank 241-C-106 Waste Retrieval Sluicing System (WRSS). The US DOE has been mandated to develop plans for response to safety issues associated with the waste storage tanks at the Hanford Site, and to report the progress of implementing those plans to Congress. The objectives of Project W-230 are to design, fabricate, develop, test, and operate a new retrieval system capable of removing a minimum of about 75% of the high-heat waste contained in C-106. It is anticipated that sluicing operations

can remove enough waste to reduce the remaining radiogenic heat load to levels low enough to resolve the high-heat safety issue as well as allow closure of the tank safety issue.

1462 (WHC-SD-WM-PTR-013) Process test evaluation report, 241-C-105. Bragg, D.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008476. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides test data and analysis for the 241-C-105 process test.

1463 (WHC-SD-WM-QAPP-009-Rev.1) 242-A evaporator quality assurance project plan: Revision 1. Tucker, B.J. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003843. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this quality assurance project plan (Plan) is sampling and analytical services including, but not limited to, sample receipt, handling and storage, analytical measurements, submittal of data deliverables, archiving selected portions of samples, returning unneeded sample material to Westinghouse Hanford Company (WHC), and/or sample disposal associated with candidate feed samples and process condensate compliance samples. Sampling and shipping activities are also included within the scope. The purpose of this project is to provide planning, implementation, and assessment guidance for achieving established data quality objectives measurement parameters. This Plan requires on-site and offsite laboratories to conform to that guidance. Laboratory conformance will help ensure that quality data are being generated and therefore, that the 242-A evaporator is operating in a safe and compliant manner. The 242-A evaporator feed stream originates from double-shell tanks (DSTs) identified as candidate feed tanks. The 242-A evaporator reduces the volume of aqueous waste contained in DSTs by boiling off water and sending it to the Liquid Effluent Retention Facility (LERF) storage basin before further treatment. The slurry product is returned to DSTs. Evaporation results in considerable savings by reducing the volume of mixed waste for disposal.

1464 (WHC-SD-WM-QAPP-018-Rev.1) Tank Waste Project Quality Assurance Program Plan. Revision 1. Clayton, R.E. Westinghouse Hanford Co., Richland, WA (United States). 20 Nov 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010084. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes all the Quality Assurance Program elements required by DOE Order 5700.6C. The elements shall be applied as applicable to specific Tank Waste Projects. A project-specific QAPP shall be issued as a supporting document which shall be used in conjunction with this QAPP. The project specific QAPP shall describe or define any special information, instructions or requirements.

1465 (WHC-SD-WM-QAPP-029) Software quality assurance plan for viscometer. Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 18 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002145. Source: OSTI; NTIS; INIS; GPO Dep.

The in situ viscometer is a portable instrument designed to raise and lower a sphere (rheometer ball) through layers of tank waste material while recording ball position, velocity, and cable tension. In the field, the viscometer attaches to a decontamination spool piece which in turn is designed to attach to any 4-inch, 150-pound flange (typical of many available tank risers). The motion of the ball and collection of data is controlled by instrumentation and control equipment housed in a separate remote control console. This document covers the product, Viscometer Data Acquisition Software. This document provides the software quality assurance plan, verification and validation plan, and configuration management plan for developing the software for the instrumentation that will be used to obtain rheology data from Tank SY-101.

1466 (WHC-SD-WM-QAPP-030) Software quality assurance plan for void fraction instrument. Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 18 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002161. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Tank SY-101 has been the focus of extensive characterization work over the past few years. The waste continually generates gases, most notably hydrogen, which are periodically released from the waste. Gas can be trapped in tank waste in three forms: as void gas (bubbles), dissolved gas, or absorbed gas. Void fraction is the volume percentage of a given sample that is comprised of void gas. The void fraction instrument (VFI) acquires the data necessary to calculate void fraction. This document covers the product, Void Fraction Data Acquisition Software. The void fraction software being developed will have the ability to control the void fraction instrument hardware and acquire data necessary to calculate the void fraction in samples. This document provides the software quality assurance plan, verification and validation plan, and configuration management plan for developing the software for the instrumentation that will be used to obtain void fraction data from Tank SY-101.

1467 (WHC-SD-WM-RD-038-Rev.1) Tank Waste Remediation System Projects Document Control Plan. Slater, G.D.; Halverson, T.G. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001984. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Tank Waste Remediation System Projects Document Control Plan is to provide requirements and responsibilities for document control for the Hanford Waste Vitrification Plant (HWVP) Project and the Initial Pretreatment Module (IPM) Project.

1468 (WHC-SD-WM-RD-049) System requirements specification for waste information and control system. Harris, R.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004153. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the requirements for the Waste Information and Control System (WICS). The document defines the functions, constraints, and objectives that pertain to WICS. This shall serve as the baseline document to ensure the needs of the Hazardous Material Control group (HMC) at 222-S Laboratory are met with regard to assurance of accuracy and quality of data taken with WICS.

1469 (WHC-SD-WM-RD-053) **Tank waste remediation system high-level waste vitrification system development and testing requirements.** Calmus, R.B. Westinghouse Hanford Co., Richland, WA (United States). 16 Feb 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008039. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the fiscal year (FY) 1995 recommended high-level waste melter system development and testing (D and T) requirements. The first phase of melter system testing (FY 1995) will focus on the feasibility of high-temperature operation of recommended high-level waste melter systems. These test requirements will be used to establish the basis for defining detailed testing work scope, cost, and schedules. This document includes a brief summary of the recommended technologies and technical issues associated with each technology. In addition, this document presents the key D and T activities and engineering evaluations to be performed for a particular technology or general melter system support feature. The strategy for testing in Phase 1 (FY 1995) is to pursue testing of the recommended high-temperature technologies, namely the high-temperature, ceramic-lined, joule-heated melter, referred to as the HTCMT, and the high-frequency, cold-wall, induction-heated melter, referred to as the cold-crucible melter (CCM). This document provides a detailed description of the FY 1995 D and T needs and requirements relative to each of the high-temperature technologies.

1470 (WHC-SD-WM-RPT-087) **Gamma Irradiation test report of simulated grout specimens for gas generation/liquid advection.** Hinman, C.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002239. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results from an irradiation test performed on four specimens of grout that were fabricated from synthetic Double Shell Slurry Feed (DSSF) liquid waste. The objective was to investigate the radiolytic generation of gases and the potential for advective rejection of waste liquids from the grout matrix and to provide experimental information for the validation of the C-Cubed calculated model. It has been demonstrated that a number of gases can be formed within the grout due to radiolytic decomposition of various chemical components that make up the grout. This observation leads to the conjecture that the potential exists for the rejection of a portion of the 60 vol% free liquid from the grout matrix driven by pressurization by these gases. It was found that, for the specimen geometries used in this test series, and for peak radiation dose accumulation rates on the order of 4 to 60 times of the initial rate expected in the grout vaults (300 Rads/hr), no liquid rejection was observed from 2% to 35% of the target exposure expected in the grout vaults (1E+08 Rads). When the irradiation rate exceeded the projected grout vault dose rate by a factor of 200 a small amount of liquid rejection was observed from one of two specimens that had received 20% more than the goal exposure. Because of the differences in the magnitudes of the relative radiation field strengths between this study and an actual grout vault, it is concluded that the potential for liquid rejection by internal gas pressurization from presently configured grout waste forms is very low for the expected conditions.

1471 (WHC-SD-WM-RPT-093) **Research of documents pertaining to waste migration from leaking**

single-shell tanks. Consort, S.D. (ICF Kaiser Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 30 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001378. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results from an investigation of the literature concerning single-shell tank (SST) leaks on the Hanford Site. The purpose of the investigation is to determine if available data confirm or refute the assertion that leaked waste from the SSTs has reached ground water. There are 67 leaking single-shell tanks (SSTs) on the Hanford Site. Although the maximum volume of leaked waste is approximately 4,013,000 L (1,060,000 gal), it is not the only waste in the ground beneath the 200 Area. Before 1966, supernatant solution was intentionally discharged from the cascading SSTs to the ground. Other leaks from piping and surface spills contributed to the waste in the ground. The maximum estimated volume of unintentionally leaked waste from the tanks is less than 1% of the intentionally released liquid waste that was sent to the cribs and trenches from the SSTs. The volume does not include the liquid waste sent intentionally from other facilities directly to the cribs, trenches, and injection wells. The components and concentrations of the intentionally released waste were in compliance with applicable standards at the time of release.

1472 (WHC-SD-WM-RPT-098) **Assessment of argon ion laser dispersive Raman spectroscopy for hot cell applications.** Crawford, B.A. Westinghouse Hanford Co., Richland, WA (United States). 24 Feb 1995. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008431. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of high-level waste tank materials at Hanford is conducted to support safety assessments and waste treatment activities. Raman spectroscopy is expected to give chemical species information which may assist in defining layering in tank waste. This report describes the dispersive Raman system used in this year's investigation and the methodology used to collect and evaluate data taken on tank waste samples. The current argon-ion Raman system was found not to be suitable for screening of tank cores, owing to silica interference, fluorescence interferences, and the extensive time required to collect and treat the data. Recommendations are given for further development.

1473 (WHC-SD-WM-RPT-102) **RMCS exhaustor data logger configuration.** Waldo, E.J. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010087. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the configuration of the Chessell Model 4200 Data Logger used in the Rotary Mode Core Sampling (RMCS) Exhaustor.

1474 (WHC-SD-WM-RPT-104) **Waste tank 241-C-106 comprehensive cooling design summary report.** Rensink, G.E.; Kriskovich, J.R. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010599. Source: OSTI; NTIS; INIS; GPO Dep.

This document recommends equipment and other items considered necessary to respond to temperature anomalies

in Tank 241-C-106. This document was prepared to serve as input to document, WHC-EP-0473.

1475 (WHC-SD-WM-RPT-105) Selection of ENRAF gauge wire material compatible with the Hanford waste tank environment. Anantatmula, R.P. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005673. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the selection of the wire material that will replace the 316 SS wire in the ENRAF level indicators.

1476 (WHC-SD-WM-RPT-107) Select retrieval sequence and blending strategy decision analysis frame. Certa, P.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Mar 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010048. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to define the decisions that need to be made to select a single-shell tank (SST) and double-shell tank (DST) retrieval sequence and a waste blending strategy for high-level waste (HLW) and low-level waste (LLW) vitrification. The document establishes the framework necessary to compare alternative retrieval sequences and blending strategies on a uniform basis. Measures of success are established; these measures will indicate when a good enough solution has been identified.

1477 (WHC-SD-WM-RPT-137) Further investigation of core sampling recovery history. Francis, P.M. Westinghouse Hanford Co., Richland, WA (United States). 12 Apr 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010588. Source: OSTI; NTIS; INIS; GPO Dep.

Review committee evaluations of the tank characterization program at WHC have called for a radical rethinking of the strategies currently in place. One possibility is that the tank core sampling systems may not be able to provide the required sample quality in all cases, and alternative sampling methods should be sought to complement the push-mode and rotary-mode systems. This report addresses the need for additional historical review of past core sampling performance, to help improve tank characterization methods. Past experiences from core sampling were compiled and analyzed by individual cores and by groupings. The information showed that the most prominent causes of poor recovery were plugging of the bit and misjudging the top segment. Methods to alleviate these problems have been incorporated into present core sampling strategies, although alternative equipment may be necessary under some circumstances.

1478 (WHC-SD-WM-SAD-016-Rev.2) Safety evaluation for adding water to tank 101-SY. Clinton, R. Westinghouse Hanford Co., Richland, WA (United States). 9 Dec 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005437. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a new water limit for Tank 241-SY-101. The original limit was set at 9600 gallons. The new limit is now 20,000 gallons. There are various activities that require the use of additional water to the tank. The main activity is the removal of the temporary mixer pump. This requires a large amount of water which will exceed the original limit. Also, other activities such as flushing, adding a viscometer, and adding a void fraction meter requires

additional water. The new limit safely incorporates these activities and allows room for more future activities.

1479 (WHC-SD-WM-SAR-064) Hazard assessments of double-shell flammable gas tanks. Fox, G.L.; Stepnewski, D.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 194p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001836. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the fourth in a series of hazard assessments performed on the double-shell flammable gas watch list tanks. This report focuses on hazards associated with the double-shell watch list tanks (101-AW, 103-AN, 104-AN, and 105-AN). While a similar assessment has already been performed for tank 103-SY, it is also included here to incorporate a more representative slurry gas mixture and provide a consistent basis for comparing results for all the flammable gas tanks. This report is intended to provide an in-depth assessment by considering the details of the gas release event and slurry gas mixing as the gas is released from the waste. The consequences of postulated gas ignition are evaluated using a plume burn model and updated ignition frequency predictions. Tank pressurization which results from a gas burn, along with the structural response, is also considered. The report is intended to support the safety basis for work activities in flammable gas tanks by showing margins to safety limits that are available in the design and procedures.

1480 (WHC-SD-WM-SARR-012-Rev.1) Accelerated safety analyses - structural analyses Phase I - structural sensitivity evaluation of single- and double-shell waste storage tanks. Becker, D.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004755. Source: OSTI; NTIS; INIS; GPO Dep.

Accelerated Safety Analyses - Phase I (ASA-Phase I) have been conducted to assess the appropriateness of existing tank farm operational controls and/or limits as now stipulated in the Operational Safety Requirements' (OSRs) and Operating Specification Documents, and to establish a technical basis for the waste tank operating safety envelope. Structural sensitivity analyses were performed to assess the response of the different waste tank configurations to variations in loading conditions, uncertainties in loading parameters, and uncertainties in material characteristics. Extensive documentation of the sensitivity analyses conducted and results obtained are provided in the detailed ASA-Phase I report, Structural Sensitivity Evaluation of Single- and Double-Shell Waste Tanks for Accelerated Safety Analysis - Phase I. This document provides a summary of the accelerated safety analyses sensitivity evaluations and the resulting findings.

1481 (WHC-SD-WM-SARR-031) Safety analysis for push-mode and rotary-mode core sampling. Milliken, N.J.; Geschke, G.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006909. Source: OSTI; NTIS; INIS; GPO Dep.

This safety analysis analyzes using the push-mode core sampling truck in the push-mode and the rotary-mode core sampling trucks in both the push- and rotary-modes to retrieve core samples that, once taken and analyzed, will yield waste characterization data for the hazardous waste tanks

at the Hanford Site. Operation of the core sampling trucks in both the push- and rotary-modes was reviewed to determine whether the release of radioactive materials could occur during operation. It was concluded that there are three credible scenarios: a sample spill outside of the tank, a steam release event, and an unfiltered release to the environment during continuous exhaust operation. The probability of a sample spill was found to be 10^{-4} /event, the probability of a steam release event was determined to fall in the unlikely range (10^{-2} /event to 10^{-4} /event), and the probability of an unfiltered release was calculated to be 5×10^{-3} /year. Typically, events with probabilities of 10^{-6} /event or less are not considered to be risk significant, and the consequences usually are not analyzed. The three accident scenarios were analyzed to calculate the dose consequences. It was determined that the steam release event is the bounding accident. The onsite and offsite dose consequences for this event are calculated to be 0.24 Sv (24 rem) and 3.2×10^{-4} Sv (32 mrem), respectively. These consequences are below the risk acceptance guidelines for an unlikely event, as established in WHC-CM-4-46, Nonreactor Facility Safety Analysis Manual. With the design features and the use of the controls presented in Section 8.0, this operation represents a minimal risk.

1482 (WHC-SD-WM-SARR-034) Safety evaluation for the interim stabilization of Tank 241-C-103. Geschke, G.R. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009155. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the basis for interim stabilization of tank 241-C-103. The document covers the removal of the organic liquid layer and the aqueous supernatant from tank 241-C-103. Hazards are identified, consequences are calculated and controls to mitigate or prevent potential accidents are developed.

1483 (WHC-SD-WM-SD-019) A summary description of the flammable gas tank safety program. Johnson, G.D.; Sherwood, D.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002077. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive liquid waste may produce hydrogen as result of the interaction of gamma radiation and water. If the waste contains organic chelating agents, additional hydrogen as well as nitrous oxide and ammonia may be produced by thermal and radiolytic decomposition of these organics. Several high-level radioactive liquid waste storage tanks, located underground at the Hanford Site in Washington State, are on a Flammable Gas Watch List. Some contain waste that produces and retains gases until large quantities of gas are released rapidly to the tank vapor space. Tanks nearly-filled to capacity have relatively little vapor space; therefore if the waste suddenly releases a large amount of hydrogen and nitrous oxide, a flammable gas mixture could result. The most notable example of a Hanford waste tank with a flammable gas problem is tank 241-SY-101. Upon occasion waste stored in this tank has released enough flammable gas to burn if an ignition source had been present inside of the tank. Several, other Hanford waste tanks exhibit similar behavior although to a lesser magnitude. Because this behavior was not adequately-addressed in safety analysis

reports for the Hanford Tank Farms, an unreviewed safety question was declared, and in 1990 the Flammable Gas Tank Safety Program was established to address this problem. The purposes of the program are as follows: (1) Provide safety documents to fill gaps in the safety analysis reports, and (2) Resolve the safety issue by acquiring knowledge about gas retention and release from radioactive liquid waste and developing mitigation technology. This document provides the general logic and work activities required to resolve the unreviewed safety question and the safety issue of flammable gas mixtures in radioactive liquid waste storage tanks.

1484 (WHC-SD-WM-SDD-024) 242-A evaporator vacuum condenser system. Smith, V.A. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005287. Source: OSTI; NTIS; INIS; GPO Dep.

This document is written for the 242-A evaporator vacuum condenser system (VCS), describing its purpose and operation within the evaporator. The document establishes the operating parameters specifying pressure, temperature, flow rates, interlock safety features and interfacing sub-systems to support its operation.

1485 (WHC-SD-WM-SDD-025) Anti-foam System design description. White, M.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001636. Source: OSTI; NTIS; INIS; GPO Dep.

The Anti-foam System is a sub-system of the 242-A Evaporator facility. The Anti-foam is used within the C-A-1 Vapor-Liquid Separator, to reduce the effect of foaming and reduce fluid bumping while the vapor and liquid are separated within the C-A-1 Vapor-Liquid Separator. Excessive foaming within the vessel may possibly cause the liquid slurry mixture in the evaporator vessel to foul the de-entrainment pads and cause plant shutdown. The Anti-foam System consists of the following primary elements: the Anti-foam Tank and the Metering Pump. The upgrades to Anti-foam System include the following: installation of a new pump, instruments, and valves; and connection of the instruments, pump and agitator associated with the Anti-foam System to the Monitoring and Control System (MCS). The 242-A Evaporator is a waste treatment facility designed to reduce liquid waste volumes currently stored in the Hanford Area double shell Waste Storage Tanks. The evaporator uses evaporative concentration to achieve this volume reduction, returning the concentrated slurry to the double-shell tanks for storage and, at the same time, releasing the process effluent to a retention facilities for eventual treatment and release to the environment.

1486 (WHC-SD-WM-SDD-027) 207-A retention basins system design description. Wahliquist, R.A. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002087. Source: OSTI; NTIS; INIS; GPO Dep.

The 242-A Evaporator is a waste treatment facility designed to reduce liquid waste volumes currently stored in the Hanford Area double shell Waste Storage Tanks. The evaporator uses evaporative concentration to achieve this volume reduction, returning the concentrated slurry to the double-shell tanks for storage. The process effluent is transferred to

various retention/treatment facilities for eventual release to the environment. The process utilizes an evaporator vessel and various supporting systems for heating, evaporating, and condensing low-heat-generating liquid waste produced at the Hanford Site. The process reduces the total volume of the liquid waste requiring storage in a double shell tank, making it more manageable for current storage as well as for future treatment and disposal. The main components of the 242-A Evaporator are the Reboiler, Vapor-Liquid Separator, Recirculation Pump and Pump Loop, Slurry System, Condenser System, Steam Jet Vacuum System, Condensate Collection Tank, and Ion Exchange System.

1487 (WHC-SD-WM-SDD-043) SY101 in situ viscometer instrument system design description. Pearce, K.L.; Stokes, T.I.; Vagelatos, N. Westinghouse Hanford Co., Richland, WA (United States). 18 Aug 1994. 476p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005684. Source: OSTI; NTIS; INIS; GPO Dep.

This documents the design and description of the in situ viscometer, developed for the hydrogen mitigation project.

1488 (WHC-SD-WM-SDD-045) System design description for SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1). Truitt, R.W. (Westinghouse Hanford Co., Richland, WA (United States)); Pounds, T.S.; Smith, S.O. Westinghouse Hanford Co., Richland, WA (United States). 24 Aug 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018436. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the hardware subsystems of the data acquisition and control system (DACS) used in mitigation tests conducted on waste tank SY-101 at the Hanford Nuclear Reservation. The system was designed and implemented by Los Alamos National Laboratory (LANL) and supplied to Westinghouse Hanford Company (WHC). The mitigation testing uses a pump immersed in the waste tank, directed at certain angles and operated at different speeds and time durations. The SY-101 tank has experienced recurrent periodic gas releases of hydrogen, nitrous oxide, ammonia, and (recently discovered) methane. The hydrogen gas represents a danger, as some of the releases are in amounts above the lower flammability limit (LFL). These large gas releases must be mitigated. Several instruments have been added to the tank to monitor the gas compositions, the tank level, the tank temperature, and other parameters. A mixer pump has been developed to stir the tank waste to cause the gases to be released at a slow rate. It is the function of the DACS to monitor those instruments and to control the mixer pump in a safe manner. During FY93 and FY94 the mixer pump was installed with associated testing operations support equipment and a mitigation test project plan was implemented. These activities successfully demonstrated the mixer pump's ability to mitigate the SY-101 tank hydrogen gas hazard.

1489 (WHC-SD-WM-SDD-048) System design description for Waste Information and Control System. Harris, R.R. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 176p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005225. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company (WHC) Hazardous Material Control Group (HMC) of the 222-S Laboratory has

requested the development of a system to help resolve many of the difficulties associated with tracking and data collection of containers and drums of waste. This system has been identified as the Waste Information and Control System (WICS). WICS shall partially automate the procedure for acquisition, tracking and reporting of the container, drum, and waste data that is currently manually processed. The WICS project shall use handheld computer units (HCU) to collect laboratory data, a local database with an user friendly interface to import the laboratory data from the HCUs, and barcode technology with associated software and operational procedures. After the container, drum, and waste data has been collected and verified, WICS shall be manipulated to provide informal reports containing data required to properly document waste disposal. 8 refs, 82 figs, 69 tabs.

1490 (WHC-SD-WM-SDD-049) System design description for mini-dacs data acquisition and control system. Vargo, F.G. Jr. (Westinghouse Hanford Co., Richland, WA (United States)); Trujillo, L.T.; Smith, S.O. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001556. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the hardware computer system, for the mini data acquisition and control system (DACS) that was fabricated by Los Alamos National Laboratory (LANL), to support the testing of the spare mixer pump for SY-101.

1491 (WHC-SD-WM-SDD-054) System design description 241-SY-101 color video camera. Kohlman, E.H.; Smet, D.B. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005677. Source: OSTI; NTIS; INIS; GPO Dep.

This System Design Description describes the major components of the 101-SY color camera system. The system is comprised of the camera assembly, the purge system, and the multiport riser unit.

1492 (WHC-SD-WM-SDD-055) Standard-B Hydrogen Monitoring System, system design description. Schneider, T.C. Westinghouse Hanford Co., Richland, WA (United States). 16 Jan 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006652. Source: OSTI; NTIS; INIS; GPO Dep.

During most of the year, it is assumed that the vapor in the 177 radioactive waste tanks on the Hanford Project site contain a uniform mixture of gases. Several of these waste tanks (currently twenty five, 6 Double Shell Tanks and 19 Single Shell Tanks) were identified as having the potential for the buildup of gases to a flammable level. An active ventilation system in the Double Shell Tanks and a passive ventilation system in the Single Shell Tanks provides a method of expelling gases from the tanks. A gas release from a tank causes a temporary rise in the tank pressure, and a potential for increased concentration of hydrogen gas in the vapor space. The gas is released via the ventilation systems until a uniform gas mixture in the vapor space is once again achieved. This document describes the design of the Standard-B Hydrogen Monitoring System, (SHMS) and its components as it differs from the original SHMS. The differences are derived from changes made to improve the system performance but not implemented in all the installed enclosures.

1493 (WHC-SD-WM-SDRR-001) Compilation of formal comments on the tank farms interim hazard and accident analyses. Ryan, G.W. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 334p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010080. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of the formal comments on the Tank Farms Interim Hazard and Accident Analyses. This document contains the RCR's that were received and subsequently resolved to develop Rev. A of WHC-SD-WM-SAR-065, Interim Chapter 3.0 Hazard and Accident Analysis.

1494 (WHC-SD-WM-SEL-033-Rev.1) Safety equipment list for 241-C-106 waste retrieval, Project W-320: Revision 1. Conner, J.C. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 364p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004112. Source: OSTI; NTIS; INIS; GPO Dep.

The goals of the C-106 sluicing operation are: (1) to stabilize the tank by reducing the heat load in the tank to less than 42 MJ/hr (40,000 Btu/hour), and (2) to initiate demonstration of single-shell tank (SST) retrieval technology. The purpose of this supporting document (SD) is as follows: (1) to provide safety classifications for items (systems, structures, equipment, components, or parts) for the waste retrieval sluicing system (WRSS), and (2) to document and methodology used to develop safety classifications. Appropriate references are made with regard to use of existing systems, structures, equipments, components, and parts for C-106 single-shell transfer tank located in the C Tank Farm, and 241-AY-102 (AY-102) double shell receiver tanks (DST) located in the Aging Waste Facility (AWF). The Waste Retrieval Sluicing System consists of two transfer lines that would connect the two tanks, one to carry the sluiced waste slurry to AY-102, and the other to return the supernatant liquid to C-106. The supernatant, or alternate fluid, will be used to mobilize waste in C-106 for the sluicing process. The equipment necessary for the WRSS include pumps in each tank, sluicers to direct the supernatant stream in C-106, a slurry distributor in AY-102, HVAC for C-106, instrumentation and control devices, and other existing components as required.

1495 (WHC-SD-WM-SOIL-001) Soil weight (lb/ft³) at Hanford waste storage locations (2 volumes). Pianka, E.W. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 632p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005299. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford Reservation waste storage tanks are fabricated in accordance with approved construction specifications. After an underground tank has been constructed in the excavation prepared for it, soil is placed around the tank and compacted by an approved compaction procedure. To ensure compliance with the construction specifications, measurements of the soil compaction are taken by QA inspectors using test methods based on American Society for the Testing and Materials (ASTM) standards. Soil compaction test data taken for the 241AP, 241AN, and 241AW tank farms constructed between 1978 and 1986 are included. The individual data values have been numerically processed to obtain average soil density values for each of these tank farms.

1496 (WHC-SD-WM-SP-001) Subsurface barrier demonstration test strategy and performance specification. Treat, R.L.; Cruse, J.M. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016460. Source: OSTI; NTIS; INIS; GPO Dep.

This document was developed to help specify a major demonstration test project of subsurface barrier systems supporting the Tank Waste Remediation System (TWRS) Program. The document focuses discussion on requirements applicable to demonstration of three subsurface barrier concepts: (1) Injected Material, (2) Cryogenic, and (3) Desiccant. Detailed requirements are provided for initial qualification of a technology proposal followed by the pre-demonstration and demonstration test requirements and specifications. Each requirement and specification is accompanied by a discussion of the rationale for it. The document also includes information on the Hanford Site tank farms and related data; the related and currently active technology development projects within the DOE's EM-50 Program; and the overall demonstration test strategy. Procurement activities and other preparations for actual demonstration testing are on hold until a decision is made regarding further development of subsurface barriers. Accordingly, this document is being issued for information only.

1497 (WHC-SD-WM-SP-006) Testing and development strategy for the tank waste remediation system. Reddick, G.W. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005619. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a strategy for performing radioactive (hot) and nonradioactive testing to support processing tank waste. It evaluates the need for hot pilot plant(s) to support pretreatment and other processing functions and presents a strategy for performing hot test work. A strategy also is provided for nonradioactive process and equipment testing. The testing strategy supports design, construction, startup, and operation of Tank Waste Remediation System (TWRS) facilities.

1498 (WHC-SD-WM-SSP-005) Grout Facilities standby plan. Claghorn, R.D.; Kison, P.F.; Nunamaker, D.R.; Yoakum, A.K. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 299p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001521. Source: OSTI; NTIS; INIS; GPO Dep.

This plan defines how the Grout Facilities will be deactivated to meet the intent of the recently renegotiated Tri-Party Agreement (TPA). The TPA calls for the use of the grout process as an emergency option only in the event that tank space is not available to resolve tank safety issues. The availability of new tanks is expected by 1997. Since a grout startup effort would take an estimated two years, a complete termination of the Grout Disposal Program is expected in December 1995. The former Tank Waste Remediation (TWRS) Strategy, adopted in 1988, called for the contents of Hanford's 28 newer double-shell waste tanks to be separated into high-level radioactive material to be vitrified and disposed of in a geologic repository; low-level wastes were to be sent to the Grout Facility to be made into a cement-like-mixture and poured into underground vaults at Hanford for disposal. The waste in the 149 older single-shell

tanks (SST) were to undergo further study and analysis before a disposal decision was made.

1499 (WHC-SD-WM-TA-154) Strategy for sampling Hanford Site tank wastes for development of disposal technology. Kupfer, M.J. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005052. Source: OSTI; NTIS; INIS; GPO Dep.

This document explains the tank waste sampling strategy needed to obtain the information required to identify and develop pretreatment and waste immobilization processes. The key tenet of the strategy is that process testing with real waste material from the Hanford Site underground tanks is necessary to design processes and measure their effectiveness. This document provides the criteria for selection of the limited number of tanks to be sampled. A phased, iterative approach is used for the single-shell tank (SST) waste sampling. In the first sampling phase, samples are taken from 25 tanks which provide a good representation of the waste types of interest. Results from process testing of these samples will be considered in final selection of a limited number of additional SSTs to sample (currently expected to be an additional 14 tanks).

1500 (WHC-SD-WM-TA-156) Tank Waste Remediation System tank waste pretreatment and vitrification process development testing requirements assessment. Howden, G.F. Westinghouse Hanford Co., Richland, WA (United States). 24 Oct 1994. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004747. Source: OSTI; NTIS; INIS; GPO Dep.

A multi-faceted study was initiated in November 1993 to provide assurance that needed testing capabilities, facilities, and support infrastructure (sampling systems, casks, transportation systems, permits, etc.) would be available when needed for process and equipment development to support pretreatment and vitrification facility design and construction schedules. This first major report provides a snapshot of the known testing needs for pretreatment, low-level waste (LLW) and high-level waste (HLW) vitrification, and documents the results of a series of preliminary studies and workshops to define the issues needing resolution by cold or hot testing. Identified in this report are more than 140 Hanford Site tank waste pretreatment and LLW/HLW vitrification technology issues that can only be resolved by testing. The report also broadly characterizes the level of testing needed to resolve each issue. A second report will provide a strategy(ies) for ensuring timely test capability. Later reports will assess the capabilities of existing facilities to support needed testing and will recommend siting of the tests together with needed facility and infrastructure upgrades or additions.

1501 (WHC-SD-WM-TA-157) M.A. Streicher findings regarding high-level waste tank corrosion issues. Husa, E.I. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003248. Source: OSTI; NTIS; INIS; GPO Dep.

Dr. Michael A. Streicher is a nationally recognized metallurgist and corrosion scientist. He has served on the Department of Energy, Headquarters Tank Structural Integrity panel as the primary corrosion technical expert since the panel's inception in October 1991. Attachments 3

through 13 are Dr. Streicher's correspondence and presentations to the panel between November 1991 and May 1994. This compilation addresses Dr. Streicher's findings on High-Level Waste tank corrosion issues such as: corrosion mechanisms in carbon steels; hydrogen generation from waste tank corrosion; stress corrosion cracking in carbon steel tanks; water line attack in Hanford's single-shell tanks; stress corrosion cracking of austenitic stainless steels; and materials selection for new Hanford waste tanks. These papers discuss both generic and specific corrosion issues associated with waste tanks and transfer systems at Hanford, Savannah River, Idaho National Engineering Laboratory, and West Valley Demonstration Project.

1502 (WHC-SD-WM-TA-158) Conceptual design analyses for Hanford Site deployable remote spectroscopy systems. Philipp, B.L.; Reich, F.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002078. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies potential remote, NIR spectroscopic waste surface moisture monitoring system design alternatives to be operated inside one of the Hanford Site, high level, nuclear waste storage tanks. Potential tank waste moisture data impacts from the remote NIR signal transfer through high humidity vapor space is evaluated.

1503 (WHC-SD-WM-TA-159) Alternative concepts for treatment and disposal of Hanford site high-level waste in tanks. Claghorn, R.D.; Powell, W.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005282. Source: OSTI; NTIS; INIS; GPO Dep.

Some innovative approaches have recently been proposed that may have significant schedule, cost, or environmental advantages which could improve the current HLW program strategy. Three general categories of alternative concepts are now under consideration: (1) process/product alternatives, (2) facility layout options, and (3) contracting strategies. This report compares the alternate approaches to the current program baseline to illustrate their potential significance and to identify the risks associated with each approach.

1504 (WHC-SD-WM-TA-160) TWRS tank waste pretreatment process development hot test siting report. Howden, G.F. (Westinghouse Hanford Co., Richland, WA (United States)); Banning, D.L.; Dodd, D.A.; Smith, D.A.; Stevens, P.F.; Hansen, R.I.; Reynolds, B.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009100. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the sixth in a series that have assessed the hot testing requirements for TWRS pretreatment process development and identified the hot testing support requirements. This report, based on the previous work, identifies specific hot test work packages, matches those packages to specific hot cell facilities, and provides recommendations of specific facilities to be employed for the pretreatment hot test work. Also identified are serious limitations in the tank waste sample retrieval and handling infrastructure. Recommendations are provided for staged development of 500 mL, 3 L, 25 L and 4000 L sample recovery systems and specific actions to provide those capabilities.

1505 (WHC-SD-WM-TC-005) Test procedure for use of the shear vane in tanks 103-SY, 103-AN, and 103-AW. LeClair, M.D.; Waters, E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005290. Source: OSTI; NTIS; INIS; GPO Dep.

This is a record copy of a test procedure for application of the full-scale shear vane to underground waste tanks at Hanford. The introduction of the report provides background information on the development and proof-testing of the shear vane, as well as information about its current location. The document was originally prepared in 1988, and the work as shelved temporarily for lack of funds. Activities to utilize the shear vane will be expedited by use of this information.

1506 (WHC-SD-WM-TC-062) Test Procedure - pumping system for caustic addition project. Leshikar, G.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000463. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure provides the requirements for sub-system testing and integrated operational testing of the submersible mixer pump and caustic addition equipment by WHC and Kaiser personnel at the Rotating Equipment Shop run-in pit (Bldg. 272E).

1507 (WHC-SD-WM-TC-066) Test procedure - Prototype core sampler. Linschooten, C.G. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003845. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test is to attempt to determine the adequacy of the prototype sampler. Recovery tests will be performed with this sampler in three different consistencies of kaolin sludge simulants. A minimum of six tests will be done in each of the simulants. The sampler is a hollow steel sampling tube with a tapered nose and a retractable point. The point is sealed against the inside wall of the sampler by two O-rings, which keep the waste material from entering the sampler prematurely. When the point is retracted, the biggest O-ring assists in collecting the sample by producing a slight negative pressure within the sampler tube. The sampler can be operated by hand. The concept is similar to, but simpler than, the present WHC rotary valve sampler in that a solid core is recovered and an O-ring piston is used to provide a negative internal pressure to assist sample recovery. The test will be performed in three 55-gallon drums each filled with a kaolin sludge of a different consistency. The drums will contain an approximate depth of 33 inches of sludge. The prototype Concord sampler will attempt to collect 19-inch samples at two distinct depths. No waste tank simulation with full length or any length of the auger shroud equipment will be attempted in this test. A simple locating and clamping tool will be made to facilitate the sampling.

1508 (WHC-SD-WM-TI-363) Descriptions and diagrams of the primary and annulus ventilation systems of the double-shell tank farms as of January 1988. Blackman, A.E.; Waters, E.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005597. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of information describing the ventilation systems of the Double-Shell Tank farms (214-AN, -AP, -AW, -AY, -AZ, and -SY). A general description of the primary tank and annulus ventilation systems is given along with specific information on the high efficiency particulate air (HEPA) filters, condensers, preheaters, exhaust fans, and piping. This information is considered to be current as of January 1988. 38 refs, 20 figs, 30 tabs.

1509 (WHC-SD-WM-TI-386) Evaluation of AY/AZ tank farm ventilation system during aging waste retrieval operations. Wong, J.J.; Waters, E.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005077. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Management is currently planning to demonstrate mobilization of radioactive waste sludges in Tank 101-AZ beginning in October 1991. The retrieval system being designed will utilize mixer pumps that generate high-velocity, high-volume submerged liquid jets to mobilize settled solids. There is concern that these jets may also generate radioactive aerosols, some of which may be carried into the tank Ventilation system. The purpose of this study is to determine if the current AY/AZ ventilation system or the proposed ventilation system upgrade (Project W-030) will provide adequate deentrainment of liquid and solid aerosols during mixer pump operations, or if the radioactive aerosols will overload the HEPA filters.

1510 (WHC-SD-WM-TI-540) Analysis report for 241-BY-104 auger samples. Beck, M.A.; Bechtold, D.B.; Hey, B.E. Westinghouse Hanford Co., Richland, WA (United States). 26 Oct 1992. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013578. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the analytical sample results for two auger samples of the tip 15 cm (6 in.) of tank 241-BY-104 salt cake. The thermal response of tank 241-BY-104 auger samples is generally mild. The level of cyanide and iron, and therefore of ferrocyanide is very low. Evidence of inhomogeneity is present for tank 241-BY-104 salt cake. Mass and charge balances were less than ideal. The concentrations found for the major constituents, except chromium, are in line with the expectations.

1511 (WHC-SD-WM-TI-540-Rev.1) Analysis report for 241-BY-104 Auger samples. Beck, M.A. Westinghouse Hanford Co., Richland, WA (United States). 10 Nov 1994. 907p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004432. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the analysis of the surface crust samples taken from single-shell tank (SST) BY-104, suspected of containing ferrocyanide wastes. This sampling and analysis will assist in ascertaining whether there is any hazard due to combustion (burning) or explosion of these solid wastes. These characteristics are important to future efforts to characterize the salt and sludge in this type of waste tank. This report will outline the methodology and detail the results of analyses performed during the characterization of this material. All analyses were performed by Westinghouse Hanford Company at the 222-S laboratory unless stated otherwise.

1512 (WHC-SD-WM-TI-573-Rev.1) Technical bases for leak detection surveillance of waste storage tanks.

Revision 1. Johnson, M.G.; Badden, J.J. Westinghouse Hanford Co., Richland, WA (United States). 13 Feb 1995. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008042. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the technical bases for specification limits, monitoring frequencies and baselines used for leak detection and intrusion (for single shell tanks only) in all single and double shell radioactive waste storage tanks, waste transfer lines, and most catch tanks and receiver tanks in the waste tank farms and associated areas at Hanford.

1513 (WHC-SD-WM-TI-577-Rev.1) Preliminary flowsheet for plasma arc calcination of selected Hanford tank waste. Hendrickson, D.W. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003270. Source: OSTI; NTIS; INIS; GPO Dep.

This preliminary flowsheet document was developed for the Initial Pretreatment Module (IPM). This flowsheet documents the calcination technology that can be used to accomplish the destruction of organics, ferrocyanide, and nitrate/nitrite salts in addition to solubilizing aluminum compounds in selected waste tanks at the Hanford Site. The flow sheet conditions are 76 L/min diluted waste feed rate at 800°C, atmospheric pressure, and 100 millisecond residence time in the calciner. Preliminary flow diagrams, material balances, and energy requirements are presented.

1514 (WHC-SD-WM-TI-591) Maximum surface level and temperature histories for Hanford waste tanks. Flanagan, B.D.; Ha, N.D.; Huisingsh, J.S. Westinghouse Hanford Co., Richland, WA (United States). 2 Sep 1994. 467p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000461. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive defense waste resulting from the chemical processing of spent nuclear fuel has been accumulating at the Hanford Site since 1944. This waste is stored in underground waste-storage tanks. The Hanford Site Tank Farm Facilities Interim Safety Basis (ISB) provides a ready reference to the safety envelope for applicable tank farm facilities and installations. During preparation of the ISB, tank structural integrity concerns were identified as a key element in defining the safety envelope. These concerns, along with several deficiencies in the technical bases associated with the structural integrity issues and the corresponding operational limits/controls specified for conduct of normal tank farm operations are documented in the ISB. Consequently, a plan was initiated to upgrade the safety envelope technical bases by conducting Accelerated Safety Analyses-Phase 1 (ASA-Phase 1) sensitivity studies and additional structural evaluations. The purpose of this report is to facilitate the ASA-Phase 1 studies and future analyses of the single-shell tanks (SSTs) and double-shell tanks (DSTs) by compiling a quantitative summary of some of the past operating conditions the tanks have experienced during their existence. This report documents the available summaries of recorded maximum surface levels and maximum waste temperatures and references other sources for more specific data.

1515 (WHC-SD-WM-TI-594-Rev.1) TMACS I/O termination point listing. Revision 1. Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 163p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001513. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a listing of all analog and discrete input/output (I/O) points connected to the Tank Monitor and Control System (TMACS). The list also provides other information such as the point tag name, termination location, description, drawing references and other parameters. The purpose is to define each point's unique tag name and to cross reference the point with other associated information that may be necessary for activities such as maintenance, calibration, diagnostics, or design changes. It provides a list in one document of all I/O points that would otherwise only be available by referring to all I/O termination drawings.

1516 (WHC-SD-WM-TI-623) Static internal pressure capacity of Hanford Single-Shell Waste Tanks. Julyk, L.J. Westinghouse Hanford Co., Richland, WA (United States). 19 Jul 1994. 566p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018681. Source: OSTI; NTIS; INIS; GPO Dep.

Underground single-shell waste storage tanks located at the Hanford Site in Richland, Washington, generate gaseous mixtures that could be ignited, challenging the structural integrity of the tanks. The structural capacity of the single-shell tanks to internal pressure is estimated through nonlinear finite-element structural analyses of the reinforced concrete tank. To determine their internal pressure capacity, designs for both the million-gallon and the half-million-gallon tank are evaluated on the basis of gross structural instability.

1517 (WHC-SD-WM-TI-633) Structural analysis and evaluation of the 241SY101 tank annulus heat-up. Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 264p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003161. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the structural analysis (static and thermal loads) of the 241SY101 tank to determine the maximum allowable temperature and rate of heating that could be applied to tank 241SY101 through annulus air heating without detrimental effects to the structural integrity of the concrete and steel liner of the tank.

1518 (WHC-SD-WM-TI-634-Rev.1) Integrated beta and gamma radiation dose calculations for the ferrocyanide waste tanks. Parra, S.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004496. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the total integrated beta and gamma radiation doses in all the ferrocyanide waste tanks. It also contains estimated gamma radiation dose rates for all single-shell waste tanks containing a liquid observation well.

1519 (WHC-SD-WM-TI-638) Preliminary flowsheet: Ion exchange for separation of cesium from Hanford tank waste using resorcinol-formaldehyde resin. Penwell, D.L. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 169p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005101. Source: OSTI; NTIS; INIS; GPO Dep.

This preliminary flowsheet document describes an ion exchange process which uses resorcinol-formaldehyde (R-F) resin to remove cesium from Hanford tank waste. The flowsheet describes one possible equipment configuration, and

contains mass balances based on that configuration with feeds of Neutralized Current Acid Waste, and Double Shell Slurry Feed. The flowsheet also discusses process alternatives, unresolved issues, and development needs associated with the ion exchange process. It is expected that this flowsheet will evolve as open issues are resolved and progress is made on development needs. This is part of the Tank Waste Remediation Program at Hanford. 26 refs, 6 figs, 25 tabs.

1520 (WHC-SD-WM-TI-645) Statistical characterization report for Single-Shell Tank 241-T-107. Cromar, R.D.; Wilmarth, S.R.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002090. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from three core samples obtained from single-shell tank 241-T-107 (T-107). Four specific topics are addressed. They are summarized below. Section 3.0 contains mean concentration estimates of analytes found in T-107. The estimates of "error" associated with the concentration estimates are given as 95% confidence intervals (CI) on the mean. The results given are based on three types of samples: core composite samples, core segment samples, and drainable liquid samples. Section 4.0 contains estimates of the spatial variability (variability between cores and between segments) and the analytical variability (variability between the primary and the duplicate analysis). Statistical tests were performed to test the hypothesis that the between cores and the between segments spatial variability is zero. The results of the tests are as follows. Based on the core composite data, the between cores variance is significantly different from zero for 35 out of 74 analytes; i.e., for 53% of the analytes there is no statistically significant difference between the concentration means for two cores. Based on core segment data, the between segments variance is significantly different from zero for 22 out of 24 analytes and the between cores variance is significantly different from zero for 4 out of 24 analytes; i.e., for 8% of the analytes there is no statistically significant difference between segment means and for 83% of the analytes there is no difference between the means from the three cores. Section 5.0 contains the results of the application of multiple comparison methods to the core composite data, the core segment data, and the drainable liquid data. Section 6.0 contains the results of a statistical test conducted to determine the 222-S Analytical Laboratory's ability to homogenize solid core segments.

1521 (WHC-SD-WM-TI-646) Bounding flow and transport analysis of proposed 105A mock-up tank tracer test. Piepho, M.G. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019009. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this bounding analysis was to determine bounding estimates of salt concentrations in the aquifer below the salt-tracer plume test at the 105A mockup-tank site near the inactive Semi-Works Plant in the 200 East Area. The objective was to calculate the bounding salt concentrations and compare them to the appropriate maximum contamination level (MCL) allowed by state law, which for sodium chloride is 415 mg/l as a secondary standard. The tracer test is part of the Electrical-Resistance Tomography (ERT) demonstration, which will provide an effective method

of detecting tank leaks if it is shown to be successful. The basic idea of ERT method is that the electrical resistance in the soils will change enough to be detected when water with salts infiltrate the soils, even if a high-conductance metal tank is just above the leak. The 105A mockup tank did not have an impermeable bottom and was open at the top until the time of the test. It was assumed, at the time of the tracer test or shortly afterwards, that an impermeable bottom (concrete) would be placed at the bottom of the tank, but still remain open at the top. Hence, in this analysis, no artificial recharge is produced due to water running off a tank top, since no top is assumed. The conceptual model is discussed in Section 2.0 with the mathematical and numerical models briefly discussed in Section 3.0. The main results are given in Section 4.0 with the conclusions drawn in Section 5.0. These calculations were made before the tracer test. A similar set of calculations will be performed after the tracer test assuming more details concerning leak location and soil properties are available. The tracer test could be used to validate or confirm the modeling methodology/capability of plumes in the vadose zone at the Hanford site.

1522 (WHC-SD-WM-TI-648) Tank characterization reference guide. De Lorenzo, D.S. (Los Alamos Technical Associates, Kennewick, WA (United States)); DiCenso, A.T.; Hiller, D.B.; Johnson, K.W.; Rutherford, J.H.; Smith, D.J.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). Sep 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001638. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of the Hanford Site high-level waste storage tanks supports safety issue resolution; operations and maintenance requirements; and retrieval, pretreatment, vitrification, and disposal technology development. Technical, historical, and programmatic information about the waste tanks is often scattered among many sources, if it is documented at all. This Tank Characterization Reference Guide, therefore, serves as a common location for much of the generic tank information that is otherwise contained in many documents. The report is intended to be an introduction to the issues and history surrounding the generation, storage, and management of the liquid process wastes, and a presentation of the sampling, analysis, and modeling activities that support the current waste characterization. This report should provide a basis upon which those unfamiliar with the Hanford Site tank farms can start their research.

1523 (WHC-SD-WM-TI-650) Statistical characterization report for single-shell tank 241-T-111. Cromar, R.D.; Wilmarth, S.R. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000674. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from two core samples obtained from single-shell tank 241-T-111 (T-111). Section 2.0 contains a description of the core samples and the chemical analyses performed on the core samples. Section 3.0 contains mean concentration estimates and associated 95% confidence intervals (CIs) on the mean for each of the analytes found in the core samples from T-111. Section 4.0 contains estimates of the spatial variability (variability between cores) and estimates of the analytical variability from the core composite data. Two types of analytical variability were estimated from the core

composite data: (1) sample composite variability (variability between composite samples within the same core) and (2) analytical measurement variability (variability between the primary and duplicate analyses within each core composite sample). Estimates of the analytical measurement variability were used as the reference value to test the significance of the spatial and sample composite variability. Spatial variability was significantly different from zero for 39 out of 85 analytes. The sample composite variance was significantly different from zero for (a different) 39 out of the 85 analytes.

1524 (WHC-SD-WM-TI-651) Waste tank characterization sampling limits. Tusler, L.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000310. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a result of the Plant Implementation Team Investigation into delayed reporting of the exotherm in Tank 241-T-111 waste samples. The corrective actions identified are to have immediate notification of appropriate Tank Farm Operations Shift Management if analyses with potential safety impact exceed established levels. A procedure, WHC-IP-0842 Section 12.18, "TWRS Approved Sampling and Data Analysis by Designated Laboratories" (WHC 1994), has been established to require all tank waste sampling (including core, auger and supernate) and tank vapor samples be performed using this document. This document establishes levels for specified analysis that require notification of the appropriate shift manager. The following categories provide numerical values for analysis that may indicate that a tank is either outside the operating specification or should be evaluated for inclusion on a Watch List. The information given is intended to translate an operating limit such as heat load, expressed in Btu/hour, to an analysis related limit, in this case cesium-137 and strontium-90 concentrations. By using the values provided as safety flags, the analytical laboratory personnel can notify a shift manager that a tank is in potential violation of an operating limit or that a tank should be considered for inclusion on a Watch List. The shift manager can then take appropriate interim measures until a final determination is made by engineering personnel.

1525 (WHC-SD-WM-TI-652) Statistical characterization report for single-shell Tank 241-S-104. Cromar, R.D.; Wilmarth, S.R.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001409. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from three core samples obtained from single-shell Tank 241-S-104 (S-104). Section 2.0 contains a description of the core samples and the chemical analyses performed on the core samples. Section 3.0 contains mean concentration estimates and associated 95% confidence intervals (CIs) on the mean for each of the analytes found in the core samples. Section 4.0 contains estimates of the spatial variability (variability between cores) and estimates of the analytical variability from the core composite data. Two types of analytical variability were estimated from the core composite data: (1) sample composite variability (variability between composite samples within the same core) and (2) analytical measurement variability (variability between the primary and duplicate analyses within each core composite sample). Estimates of the analytical measurement variability were used as the reference value to test the significance of

the spatial and sample composite variability. Spatial variability was significantly different from zero for 22 out of 63 analytes. The sample composite variance was significantly different from zero for 20 out of the 63 analytes.

1526 (WHC-SD-WM-TI-653) Statistical characterization report for single-shell tank 241-T-105. Cromar, R.D.; Wilmarth, S.R. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000675. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from the solid material found in the first segment of two core samples obtained from single-shell tank 241-T-105 (T-105). Section 2.0 contains a description of the core samples and the chemical analyses done on the core samples. Section 3.0 contains mean concentration estimates and associated 95% confidence intervals (CIs) on the mean for each of the analytes in T-105. Section 4.0 contains estimates of the spatial variability (variability between cores) and estimates of the analytical variability. Estimates of the analytical measurement variability were used as the reference value to test the significance of the spatial variability. The spatial variability was significantly different from zero for 49 out of 71 analytes in T-105.

1527 (WHC-SD-WM-TI-656) Safety evaluation of interim stabilization of non-stabilized single-shell watch list tanks. Stahl, S.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001537. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides results of a review of recently completed safety analyses related to hazards associated with Interim Stabilization of Single analyses related to hazards included on the Hanford Site Waste Tank-Watch Shell Tanks (SSTs) that are included on the Hanford List. The purpose of the review was to identify and summarize conclusions regarding the safety of interim stabilization of Watch List SSTs, and to highlight applicable limitations, restrictions, and controls. The scope of this review was restricted to SSTs identified List in the categories of flammable gas ferrocyanide, and organic salts. High heat tanks were not included in the scope. A Watch List tank is defined as an underground storage tank containing waste that requires special safety precautions because it may have a serious potential for release of high level radioactive waste because of uncontrolled increases in temperature or pressure. Special restrictions have been placed on these tanks.

1528 (WHC-SD-WM-TI-656-Rev.1) Safety evaluation of interim stabilization of non-stabilized single-shell watch list tanks. Stahl, S.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005216. Source: OSTI; NTIS; INIS; GPO Dep.

The report provides a summation of the status of safety issues associated with interim stabilization of Watch List SSTs (organic, ferrocyanide, and flammable gas), as extracted from recent safety analyses, including the Tank Farms Accelerated Safety Analysis efforts.

1529 (WHC-SD-WM-TI-657) TWRS baseline system description. Lee, A.K. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 24p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010069. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a description of the baseline system conceptualized for remediating the tank waste stored within the Hanford Site. Remediation of the tank waste will be performed by the Tank Waste Remediation System (TWRS). This baseline system description (BSD) document has been prepared to describe the current planning basis for the TWRS for accomplishing the tank waste remediation functions. The BSD document is not intended to prescribe firm program management strategies for implementing the TWRS. The scope of the TWRS Program includes managing existing facilities, developing technology for new systems; building, testing and operating new facilities; and maintaining the system. The TWRS Program will manage the system used for receiving, safely storing, maintaining, treating, and disposing onsite, or packaging for offsite disposal, all tank waste. The scope of the TWRS Program encompasses existing facilities such as waste storage tanks, evaporators, pipelines, and low-level radioactive waste treatment and disposal facilities. It includes support facilities that comprise the total TWRS infrastructure, including upgrades to existing facilities or equipment and the addition of new facilities.

1530 (WHC-SD-WM-TI-658) Statistical characterization report for Single-Shell Tank 241-T-104. Cromar, R.D.; Wilmarth, S.R.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001034. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from two core samples obtained from single-shell tank 241-T-104 (T-104). Section 2.0 contains a description of the core samples and the chemical analyses performed on the core samples. Section 3.0 contains mean concentration estimates and associated 95% confidence intervals (CIs) on the mean for each of the analytes found in the core composite samples. Section 4.0 contains estimates of the spatial variability (variability between cores) and estimates of the analytical variability from the core composite data. Two types of analytical variability were estimated from the core composite data: (1) sample composite variability (variability between composite samples within the same core) and (2) analytical measurement variability (variability between the primary and duplicate analyses within each core composite sample). Estimates of the analytical measurement variability were used as the reference value to test the significance of the spatial and sample composite variability. Spatial variability was significantly different from zero for 32 out of 80 analytes. The sample composite variance was significantly different from zero for 18 out of the 80 analytes.

1531 (WHC-SD-WM-TI-661) Waste behavior analysis for tank 241-SY-103. Wilkins, N.E. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002084. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-SY-103 is on the Flammable Gas Watch List. The waste in this tank behaves similarly to that in tank 241-SY-101. Both show slurry growth and periodic surface level drops. However, the surface level drops are much smaller than those in tank 101-SY. A standard hydrogen monitoring system (SHMS) was recently installed in tank 103-SY, and waste auger samples were recently taken. This document

covers the characterization results to date for the auger samples, and the behavior of the tank waste during both steady state periods and gas release events.

1532 (WHC-SD-WM-TI-664) Evaluation of FTIR-based analytical methods for the analysis of simulated wastes. Rebagay, T.V.; Cash, R.J.; Dodd, D.A.; Lockrem, L.L.; Meacham, J.E.; Winkelman, W.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001377. Source: OSTI; NTIS; INIS; GPO Dep.

Three FTIR-based analytical methods that have potential to characterize simulated waste tank materials have been evaluated. These include: (1) fiber optics, (2) modular transfer optic using light guides equipped with non-contact sampling peripherals, and (3) photoacoustic spectroscopy. Pertinent instrumentation and experimental procedures for each method are described. The results show that the near-infrared (NIR) region of the infrared spectrum is the region of choice for the measurement of moisture in waste simulants. Differentiation of the NIR spectrum, as a preprocessing steps, will improve the analytical result. Preliminary data indicate that prominent combination bands of water and the first overtone band of the ferrocyanide stretching vibration may be utilized to measure water and ferrocyanide species simultaneously. Both near-infrared and mid-infrared spectra must be collected, however, to measure ferrocyanide species unambiguously and accurately. For ease of sample handling and the potential for field or waste tank deployment, the FTIR-Fiber Optic method is preferred over the other two methods. Modular transfer optic using light guides and photoacoustic spectroscopy may be used as backup systems and for the validation of the fiber optic data.

1533 (WHC-SD-WM-TI-665) Soil load above Hanford waste storage tanks (2 volumes). Pianka, E.W. (Advent Engineering Services, Inc., San Ramon, CA (United States)). Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 184p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006902. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of work performed as part of the Dome Load Control Project in 1994. Section 2 contains the calculations of the weight of the soil over the tank dome for each of the 75-foot-diameter waste-storage tanks located at the Hanford Site. The chosen soil specific weight and soil depth measured at the apex of the dome crown are the same as those used in the primary analysis that qualified the design. Section 3 provides reference dimensions for each of the tank farm sites. The reference dimensions spatially orient the tanks and provide an outer diameter for each tank. Section 4 summarizes the available soil surface elevation data. It also provides examples of the calculations performed to establish the present soil elevation estimates. The survey data and other data sources from which the elevation data has been obtained are printed separately in Volume 2 of this Supporting Document. Section 5 contains tables that provide an overall summary of the present status of dome loads. Tables summarizing the load state corresponding to the soil depth and soil specific weight for the original qualification analysis, the gravity load requalification for soil depth and soil specific weight greater than the expected actual values, and a best estimate condition of soil depth and specific weight are presented for the Double-Shell

Tanks. For the Single-Shell Tanks, only the original qualification analysis is available; thus, the tabulated results are for this case only. Section 6 provides a brief overview of past analysis and testing results that given an indication of the load capacity of the waste storage tanks that corresponds to a condition approaching ultimate failure of the tank. 31 refs.

1534 (WHC-SD-WM-TI-666) Sample Exchange Evaluation (SEE) Report - Phase II. Winters, W.I. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 154p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004502. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results from Phase II of the Sample Exchange Evaluation (SEE) Program, a joint effort to compare analytical laboratory performance on samples from the Hanford Site's high-level waste tanks. In Phase II, the program has been expanded to include inorganic constituents in addition to radionuclides. Results from Phase II that exceeded 20% relative percent difference criteria are identified.

1535 (WHC-SD-WM-TI-667) Preliminary flowsheet: Ion exchange process for the separation of cesium from Hanford tank waste using Duolite™ CS-100 resin. Eager, K.M.; Penwell, D.L.; Knutson, B.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 174p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005281. Source: OSTI; NTIS; INIS; GPO Dep.

This preliminary flowsheet document describes an ion exchange process which uses Duolite™ CS-100 resin to remove cesium from Hanford Tank waste. The flowsheet describes one possible equipment configuration, and contains mass balances based on that configuration with feeds of Neutralized Current Acid Waste, and Double Shell Slurry Feed. Process alternatives, unresolved issues, and development needs are discussed which relate to the process.

1536 (WHC-SD-WM-TI-668) Central waste complex Dose Equivalent Curie estimate for packages not included in building inventory. Stratman, C.L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003156. Source: OSTI; NTIS; INIS; GPO Dep.

This document estimates the Dose Equivalent Curie content of the packages not included in the building inventory because they contain less than A-2 limits. The inventory of radioisotopes in the Central Waste Complex (CWC) are controlled and tracked using Dose Equivalent Curie's (CWC DECI), however packages with less than A-2 quantities are excluded from the CWC DECI inventory process. A-2 quantities or the A-2 limit as it is referred to in this report, refer to the maximum activity of radioactive material permitted in a Department of Transportation (DOT) type A package as defined in 49 CFR 173.403. The facility inventory limit as calculated in the CWC safety documentation includes a 5% allowance intended to account for the less than A-2 limit containers, this limit is given as 8.5 CWC DECI. The objective of this report is to estimate the CWC DECI for the packages in building 2403WA that currently have no CWC DECI values as they fall under the A-2 limit, and compare that inventory with the 5% allowed for these packages.

1537 (WHC-SD-WM-TI-674) Number of core samples: Mean concentrations and confidence intervals. Jensen, L. (Westinghouse Hanford Co., Richland, WA

(United States)); Cromar, R.D.; Wilmarth, S.R.; Heasler, P.G. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006908. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides estimates of how well the mean concentration of analytes are known as a function of the number of core samples, composite samples, and replicate analyses. The estimates are based upon core composite data from nine recently sampled single-shell tanks. The results can be used when determining the number of core samples needed to "characterize" the waste from similar single-shell tanks. A standard way of expressing uncertainty in the estimate of a mean is with a 95% confidence interval (CI). The authors investigate how the width of a 95% CI on the mean concentration decreases as the number of observations increase. Specifically, the tables and figures show how the relative half-width (RHW) of a 95% CI decreases as the number of core samples increases. The RHW of a CI is a unit-less measure of uncertainty. The general conclusions are as follows: (1) the RHW decreases dramatically as the number of core samples is increased, the decrease is much smaller when the number of composited samples or the number of replicate analyses are increased; (2) if the mean concentration of an analyte needs to be estimated with a small RHW, then a large number of core samples is required. The estimated number of core samples given in the tables and figures were determined by specifying different sizes of the RHW. Four nominal sizes were examined: 10%, 25%, 50%, and 100% of the observed mean concentration. For a majority of analytes the number of core samples required to achieve an accuracy within 10% of the mean concentration is extremely large. In many cases, however, two or three core samples is sufficient to achieve a RHW of approximately 50 to 100%. Because many of the analytes in the data have small concentrations, this level of accuracy may be satisfactory for some applications.

1538 (WHC-SD-WM-TI-677) Dose rate calculations for the removal of the mixer pump from Tank 101 SY. Schwarz, R.A. Westinghouse Hanford Co., Richland, WA (United States). 17 Feb 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008048. Source: OSTI; NTIS; INIS; GPO Dep.

Plans are currently being made for the removal of the mixer pump in tank 101 SY. Because the pump is contaminated with radioactive waste, it is essential that those involved in the pump removal operation have an indication of the expected dose rates when the pump is removed. Calculations were made to determine the dose rates for removing the pump, inserting the pump into a shipping container and filling the shipping container with either steel or lead shot for shielding.

1539 (WHC-SD-WM-TI-682) Results of gas monitoring of double-shell flammable gas watch list tanks. Wilkins, N.E. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006894. Source: OSTI; NTIS; INIS; GPO Dep.

Tanks 103-SY; 101-AW; 103-, 104-, and 105-AN are on the Flammable Gas Watch List. Recently, standard hydrogen monitoring system (SHMS) cabinets have been installed in the vent header of each of these tanks. Grab samples

have been taken once per week, and a gas chromatograph was installed on tank 104-AN as a field test. The data that have been collected since gas monitoring began on these tanks are summarized in this document.

1540 (WHC-SD-WM-TI-692) Tank Waste Remediation System waste pretreatment glossary. Gasper, K.A. Westinghouse Hanford Co., Richland, WA (United States). 12 Apr 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010590. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines terms frequently used in Waste Pretreatment documents. Terms are listed according to their use in the Pretreatment program, general project, or cost and scheduling documents. There are approximately 230 entries.

1541 (WHC-SD-WM-TI-693) Preliminary time-phased TWRS process model results. Orme, R.M. Westinghouse Hanford Co., Richland, WA (United States). 24 Mar 1995. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010081. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the first phase of efforts to model the retrieval and processing of Hanford tank waste within the constraints of an assumed tank farm configuration. This time-phased approach simulates a first try at a retrieval sequence, the batching of waste through retrieval facilities, the batching of retrieved waste through enhanced sludge washing, the batching of liquids through pretreatment and low-level waste (LLW) vitrification, and the batching of pretreated solids through high-level waste (HLW) vitrification. The results reflect the outcome of an assumed retrieval sequence that has not been tailored with respect to accepted measures of performance. The batch data, composition variability, and final waste volume projects in this report should be regarded as tentative. Nevertheless, the results provide interesting insights into time-phased processing of the tank waste. Inspection of the composition variability, for example, suggests modifications to the retrieval sequence that will further improve the uniformity of feed to the vitrification facilities. This model will be a valuable tool for evaluating suggested retrieval sequences and establishing a time-phased processing baseline. An official recommendation on tank retrieval sequence will be made in September, 1995.

1542 (WHC-SD-WM-TP-147) Evaluating airborne radionuclide concentrations in the tank farms. Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). 6 May 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005595. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study is to determine, through the collection of grab sampling data, that an in-depth resuspension study should or should not be performed. Currently there is not enough data available to determine if a potential health hazard exists due to resuspended contamination in the tank farms. A detailed resuspension study is currently not justified, because the limited quantity of air sample data collected does not indicate the existence of a potential health hazard.

1543 (WHC-SD-WM-TP-180) Grout gas generation test plan. Person, J.C. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95005623. Source: OSTI; NTIS; INIS; GPO Dep.

Disclosed are detailed procedures for measuring the rate of gas generation by grout made from synthetic tanks wastes or actual tank material. Objective is to measure the rate of gas generation for various gases (H_2 , N_2O , etc.) produced when grout, prepared using tank waste, is heated at 65 C. Experiments will also be conducted using grout from synthetic tank waste, as practice. Purpose is to provide data for evaluation of safety risks presented by gas generation in the grout vault after making grout with tank waste, as verification/confirmation for gas generation rates for the ANL testing.

1544 (WHC-SD-WM-TP-193) Non-destructive examination of grouted waste. Benny, H.L. Westinghouse Hanford Co., Richland, WA (United States). 18 Nov 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004150. Source: OSTI; NTIS; INIS; GPO Dep.

This data report contains the results of ultrasonic pulse velocity (UPV) and unconfined compressive strength (USC) measurements on a grouted simulant of 106AN tank waste. This testing program was conducted according to the requirements detailed in WHC-1993a. If successful, these methods could lead to a system for the remote verification of waste form quality. The objectives of this testing program were: to determine if a relationship exists between the velocity of ultrasonic compression waves and the unconfined compressive strength of simulated grouted waste, and if so, determine if the relationship is a valid method for grout quality assessment; and to determine if a relationship exists between the attenuation of wave amplitude and the age of test specimens. The first objective was met, in that a relationship between the UPV waves and USC was determined. This method appears to provide a valid measure of the quality of the grouted waste, as discussed in Sections 3.0 and 4.0. The second objective, to determine if the attenuation of UPV waves was related to the age of test specimens was partially met. A relationship does exist between wave amplitude and age, but it is doubtful that this method alone can be used to verify the overall quality of grouted waste. Section 2.0 describes the test methods, with the results detailed in Section 3.0. A discussion of the results are provided in Section 4.0.

1545 (WHC-SD-WM-TP-200) Tank 241-T-111 tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 10 Jan 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006826. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-T-111.

1546 (WHC-SD-WM-TP-206) Tank 241-C-102, tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004977. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-C-102.

1547 (WHC-SD-WM-TP-207) Tank 241-C-103 tank characterization plan. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Oct 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002080. Source: OSTI; NTIS; INIS; GPO Dep.

The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling analytical needs for the resolution of safety issues. A Tank Characterization Plant (TCP) will be developed for each double shell tank (DST) and single-shell tank (SST) using the DQO process. There are four Watch list tank classifications (ferrocyanide, organic salts, hydrogen/flammable gas, and high heat load). These classifications cover the six safety issues related to public and worker health that have been associated with the Hanford Site underground storage tanks. These safety issues are as follows: ferrocyanide, flammable gas, organic, criticality, high heat, and vapor safety issues. Tank C-103 is one of the twenty tanks currently on the Organic Salts Watch List. This TCP will identify characterization objectives pertaining to sample collection, hot cell sample isolation, and laboratory analytical evaluation and reporting requirements in accordance with the appropriate DQO documents. In addition, the current contents and status of the tank are projected from historical information. The relevant safety issues that are of concern for tanks on the Organic Salts Watch List are: the potential for an exothermic reaction occurring from the flammable mixture of organic materials and nitrate/nitrite salts that could result in a release of radioactive material and the possibility that other safety issues may exist for the tank.

1548 (WHC-SD-WM-TP-207-Rev.1) Tank 241-C-103 tank characterization plan. Revision 1. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 24 Jan 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006890. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-C-103.

1549 (WHC-SD-WM-TP-216) Tank 241-AN-102 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 3 Feb 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007218. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, PNL 325 Analytical Chemistry Laboratory, and WHC 222-S Laboratory. The scope of this plane is to

provide guidance for the sampling and analysis of samples for tank 241-AN-102.

1550 (WHC-SD-WM-TP-217-Rev.1) Tank 241-BY-106 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006897. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, PNL 325 Analytical Chemistry Laboratory, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-BY-106.

1551 (WHC-SD-WM-TP-218-Rev.1) Tank 241-BY-105 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006777. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, PNL 325 Analytical Chemistry Laboratory, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-BY-105.

1552 (WHC-SD-WM-TP-219-Rev.1) Engineering test plan for Tank 241-SY-101 in situ viscometer. Revision 1. Stokes, T.I.; Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002118. Source: OSTI; NTIS; INIS; GPO Dep.

To obtain in situ measurements of the rheological properties within tank 241-SY-101, this document will implement the test strategy defined in PNLMIT-041994, Acquisition and Reduction of Data Obtained in Tank SY-101 with the Ball Rheometer. Instructions for all sequences are defined within the procedure. All safety requirements as defined in LA-UR-92-3196, A Safety Assessment for Proposed Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-101-SY have been implemented into this procedure.

1553 (WHC-SD-WM-TP-219-Rev.2) Engineering test plan for Tank 241-SY-101 in situ viscometer. Sobocinski, R.G.; Stokes, T.I.; Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005146. Source: OSTI; NTIS; INIS; GPO Dep.

To obtain in situ measurements of the rheological properties within tank 241-SY-101, this document will implement the test strategy defined in PNLMIT-041994, acquisition and Reduction of Data Obtained in Tank SY-101 with the Ball Rheometer. Instructions for all sequences are defined within the procedure. All safety requirements as defined in LA-UR-92-3196, A Safety Assessment for Proposed Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-101-SY have been implemented into this procedure.

1554 (WHC-SD-WM-TP-227) Tank 241-AX-102 tank characterization plan. Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 26 Aug 1994. 18p. Sponsored by USDOE, Washington, DC (United

25 Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008883. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board has advised the DOE to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling and analytical needs for the resolution of safety issues. Tank C-105 was on the Higher Heat Load Watch List. However, it is presently classified as a non-Watch List low heat load tank and is monitored weekly. This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from Tank 241-C-105.

1570 (WHC-SD-WM-TP-263) Elevated drum testing Phase 1 test plan. McBeath, R.S.; Meeuwssen, P.V. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001039. Source: OSTI; NTIS; INIS; GPO Dep.

An important part of the Hanford environmental mission is the packaging, transportation, and storage of solid radioactive wastes in metal drums. Presently storage drums are placed four to a wooden pallet with the drums banded to each other. Palletized drums are stacked three units high in pre-engineered steel structures in the 200 Area of the Hanford site. Permitted storage space is expensive to construct, maintain, and operate. Storage capacity is increased if additional drum can be stacked within existing facilities and a cost savings over new construction realized. The purpose of this plan is to outline the testing required to provide the safety criteria for elevated (i.e., tiers of four high) drum storage. The major safety concern with elevated drum storage is the danger of a significant fire in the storage facility. The major fire load within the storage facilities is combustible material contained in the drums. If a seismic event, fork lift accident, or other credible incident were to cause drum failure or lid separation, combustible material could be available for fuel. To increase the initial burn in the facilities, the drums must spill their combustible contents, making them free for ignition. If it can be shown that there is not sufficient damage to the drums to allow for release of their solid contents, then the data used for safety documentation will be re-examined. Preliminary tests conducted in the configurations detailed in this test plan have shown that drums maintain their integrity; that is the drum covers remain attached and the drums do not breach. These tests will be conducted by Westinghouse Hanford Company, Equipment Development organization, who is the designated DOE Center of Excellence to conduct drop tests for Department of Transportation (DOT) certification of DOE designed packages and containers.

1571 (WHC-SD-WM-TP-265) Test plan for Enraf Series 854 level gauge testing in Tank 241-S-106. Barnes, G.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018508. Source: OSTI; NTIS; INIS; GPO Dep.

An Enraf Series 854 level gauge was installed on Tank 241-S-106 (S-106) during the first week of June 1994. On August 11, 1994, the gauge's measuring wire broke. An investigation has been started to determine how the wire broke. This test plan identifies a qualification test that is part

of this investigation. This test will also provide evidence as to the location and extent of potential corrosion on the measuring wire due to tank environment. The results from this testing will provide data for better material selections. This test will involve placing the existing Enraf Series 854 level gauge back into service with the same type of measuring wire (316 stainless steel) that originally broke on August 11, 1994. The gauge will be operated for 14 days. At the end of the 14-day test, the wire shall be sent to Pacific Northwest Laboratory (PNL) for analysis.

1572 (WHC-SD-WM-TP-266) Test plan for slow speed core sampling envelope test. Ralston, G.L. Westinghouse Hanford Co., Richland, WA (United States). 27 Dec 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003944. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the testing parameters used to establish an operating envelope for slow rotation core sampling without purge gas for cooling.

1573 (WHC-SD-WM-TP-267) Test plan for Enraf Series 854 level gauge wire testing. Barnes, G.A. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000432. Source: OSTI; NTIS; INIS; GPO Dep.

An Enraf Series 854 level gauge was installed on tank 241-S-106 during the first week of June 1994. On August 11, 1994, the gauge's stainless steel measuring wire broke. After examination and laboratory analysis, it was determined that the wire broke due to severe chloride ion corrosion. It is suspected that the chloride ion contamination came from the radiation induced breakdown of the polyvinyl chloride (PVC) riser liner. It is well documented that the breakdown of PVC due to radiation produces chloride containing compounds. This document provides a qualification test plan to remove and have analyzed the wire in all of the Enraf Series 854 that have been installed to date. These tests will confirm the presence or absence of chloride ions in the PVC liners and/or on the Enraf measuring wires installed in the tanks. This test will involve removing the 316 stainless steel wire drums from all of the existing Enraf Series 854 level gauges that have been installed. New 316 stainless steel wire drums shall be installed into the gauges and the gauges will be placed back into service. The wire that is removed from the gauges shall be sent to the 222-S Lab or the Pacific Northwest Laboratory (PNL) for analysis. Additional wire replacements will occur at intervals as determined necessary by the results of the laboratory analyses.

1574 (WHC-SD-WM-TP-268) 241-TX acoustic monitoring 114TX tank waste. Hurley, J.V. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005639. Source: OSTI; NTIS; INIS; GPO Dep.

This test will involve raising and lowering a sound transmitter in one low and receiver hydrophones in another low at 0.5 ft. intervals over a 12 ft. depth, which is the depth of the waste. The soundings are recorded by equipment outside the tank farm fence.

1575 (WHC-SD-WM-TP-271) Test plan for core sampling drill bit temperature monitor. Francis, P.M. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 9p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. Order Number DE95002094. Source: OSTI; NTIS; INIS; GPO Dep.

At WHC, one of the functions of the Tank Waste Remediation System division is sampling waste tanks to characterize their contents. The push-mode core sampling truck is currently used to take samples of liquid and sludge. Sampling of tanks containing hard salt cake is to be performed with the rotary-mode core sampling system, consisting of the core sample truck, mobile exhaust unit, and ancillary subsystems. When drilling through the salt cake material, friction and heat can be generated in the drill bit. Based upon tank safety reviews, it has been determined that the drill bit temperature must not exceed 180 C, due to the potential reactivity of tank contents at this temperature. Consequently, a drill bit temperature limit of 150 C was established for operation of the core sample truck to have an adequate margin of safety. Unpredictable factors, such as localized heating, cause this buffer to be so great. The most desirable safeguard against exceeding this threshold is bit temperature monitoring. This document describes the recommended plan for testing the prototype of a drill bit temperature monitor developed for core sampling by Sandia National Labs. The device will be tested at their facilities. This test plan documents the tests that Westinghouse Hanford Company considers necessary for effective testing of the system.

1576 (WHC-SD-WM-TP-273) Tank 244A tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003246. Source: OSTI; NTIS; INIS; GPO Dep.

The Double-Shell Tank (DST) System currently receives waste from the Single-Shell Tank (SST) System in support of SST stabilization efforts or from other on-site facilities which generate or store waste. Waste is also transferred between individual DSTs. The mixing or commingling of potentially incompatible waste types at the Hanford Site must be addressed prior to any waste transfers into the DSTs. The primary goal of the Waste Compatibility Program is to prevent the formation of an Unreviewed Safety Question (USQ) as a result of improper waste management. Tank 244A is a Double Contained Receiver Tank (DCRT) which serves as any overflow tank for the East Area Farms. Waste material is able to flow freely between the underground storage tanks and tank 244A. Therefore, it is necessary to test the waste in tank 244A for compatibility purposes. Two issues related to the overall problem of waste compatibility must be evaluated: Assurance of continued operability during waste transfer and waste concentration and Assurance that safety problems are not created as a result of commingling wastes under interim storage. The results of the grab sampling activity prescribed by this Tank Characterization Plan shall help determine the potential for four kinds of safety problems: criticality, flammable gas accumulation, energetics, and corrosion and leakage.

1577 (WHC-SD-WM-TP-274) Tank 241-BY-107 tank characterization plan. Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 21 Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003223. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, Oak Ridge National Laboratory, and PNL 329 Laboratory. The scope of

this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-BY-107.

1578 (WHC-SD-WM-TP-275) Tank 241-BY-108 tank characterization plan. Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 21 Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003249. Source: OSTI; NTIS; INIS; GPO Dep.

The sampling and analytical needs associated with the 51 Hanford Site underground storage tanks classified on one or more of the four Watch Lists (ferrocyanide, organic, flammable gas, and high heat), and the safety screening of all 177 tanks have been identified through the Data Quality Objective (DQO) process. DQOs identify information needed by a program group in the Tank Waste Remediation System concerned with safety issues, regulatory requirements, or the transporting and processing of tank waste. This Tank Characterization Plan will identify characterization objectives for tank BY-108 pertaining to sample collection, sample preparation and analysis, and laboratory analytical evaluation and reporting requirements. In addition, an estimate of the current contents and status of the tank is given. Single-shell tank BY-108 is classified as a Ferrocyanide Watch List tank. The tank was declared an assumed leaker and removed from service in 1972; interim stabilization was completed in February 1985. Although not officially an Organic Watch List tank, restrictions have been placed on intrusive operations by Standing Order #94-16 (dated 09/08/94) since the tank is suspected to contain or to have contained a floating organic layer.

1579 (WHC-SD-WM-TP-276) Tank ER 311 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003229. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, 325 Analytical Chemistry Laboratory and 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of liquid grab samples for tank ER 311.

1580 (WHC-SD-WM-TP-277) Tank 241-AP-106 tank characterization plan. Valenzuela, B.D. Westinghouse Hanford Co., Richland, WA (United States). 7 Nov 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003769. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-AP-106.

1581 (WHC-SD-WM-TP-277-Rev.1) Tank 241-AP-106 tank characterization plan: Revision 1. Valenzuela, B.D. Westinghouse Hanford Co., Richland, WA (United States). 17 Nov 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003848. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-AP-106 (AP-106) is a candidate feed tank which is expected to be processed at the 242-A Evaporator. Three issues related to the overall concern of the evaporator must

be evaluated: compatibility of the candidate waste with respect to feed tank, slurry tank, and evaporator requirements; safety parameters of the candidate waste tank to avoid a facility condition which is outside the safety boundaries; and compliance of the waste as dictated by regulations from various government and environmental agencies. The characterization efforts of this Tank Characterization Plan are focused on the resolution of the issues above. To evaluate the potential for waste incompatibility with the feed tank, slurry tank, and evaporator, as well as relevant safety issues, analyses will be performed on the grab samples obtained from tank AP-106. These analyses are discussed in Section 4.0. Once the characterization of tank AP-106 has been performed, the waste compatibility and safety assessment shall be conducted. This effort is discussed elsewhere.

1582 (WHC-SD-WM-TP-279) Tank 241-BY-110 tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003079. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, Oak Ridge National Laboratory, and PNL 329 Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-BY-110.

1583 (WHC-SD-WM-TP-280) Tank 241-BY-111 tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 3 Nov 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003842. Source: OSTI; NTIS; INIS; GPO Dep.

The sampling and analytical needs associated with the 51 Hanford Site underground storage tanks classified on one or more of the four Watch Lists (ferrocyanide, organic, flammable gas, and high heat), and the safety screening of all 177 tanks have been identified through the Data Quality Objective (DQO) process. DQO's identify information needed by a program group in the Tank Waste Remediation System concerned with safety issues, regulatory requirements, or the transporting and processing of tank waste. This Tank Characterization Plan will identify characterization objectives for Tank BY-111 pertaining to sample collection, sample preparation and analysis, and laboratory analytical evaluation and reporting requirements. In addition, an estimate of the current contents and status of the tank is given.

1584 (WHC-SD-WM-TP-281) Tank 241-BY-112 Characterization Plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003078. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, Oak Ridge National Laboratory, and PNL 329 Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-BY-112.

1585 (WHC-SD-WM-TP-283) Test plan for the selection of the ENRAF gauge wire material. Anantatmula, R.P. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 5p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. Order Number DE95010082. Source: OSTI; NTIS; INIS; GPO Dep.

The measurement of liquid levels is the primary method of early leak detection in some underground waste storage tanks at Hanford, as well as for the detection of intrusion of liquids into the tanks. The gauges used for many years for this purpose are no longer available and are rapidly failing. After extensive evaluation and testing, the ENRAF Series 854 level gauge was selected as the primary instrument for monitoring waste surface levels. The material for the wire from which the displacer of the gauge is suspended was selected to be type 316 stainless steel based upon its excellent corrosion resistance in Hanford tank wastes. After approximately 10 weeks of service, the displacer attached to the gauge installed in tank 241-S-106 separated from the wire. It was determined that the wire failure was due to chloride ion stress corrosion cracking of the 316 wire. Radiation induced breakdown of the polyvinyl chloride (PVC) riser liners is suspected to be the source of the chloride ions. The task team proposed short-term and long-term actions. The short-term actions included evaluating the source of the chloride ions, while continuing to monitor liquid levels. One of the long-term actions is the selection of a wire material that is compatible with the PVC liner and the tank waste environment. This document describes the test plan for the selection of one material, from the list of candidate materials, that is the most suitable material for use in the combined environment of the PVC liner and the tank waste. The candidate materials to be tested are Hastelloy C-22, Pt-10% Rh, Pt-20% Rh, and Pt-20% Ir.

1586 (WHC-SD-WM-TP-284) Tank 241-AZ-101 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Feb 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007195. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board has advised the DOE to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The Data Quality Objective (DQO) process was chosen as a tool to be used in the resolution of safety issues. As a result, A revision in the Federal Facilities Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process. Development of TCPs by the DQO process is intended to allow users to ensure their needs will be met and that resources are devoted to gaining only necessary information". This document satisfies that requirement for Tank 241-AZ-101 (AZ-101) sampling activities. Tank AZ-101 is currently a non-Watch List tank, so the only DQOs applicable to this tank are the safety screening DQO and the compatibility DQO, as described below. The contents of Tank AZ-101, as of October 31, 1994, consisted of 3,630 kL (960 kgal) of dilute non-complexed waste and aging waste from PUREX (NCAW, neutralized current acid waste). Tank AZ-101 is expected to have two primary layers. The bottom layer is composed of 132 kL of sludge, and the top layer is composed of 3,500 kL of supernatant, with a total tank waste depth of approximately 8.87 meters.

1587 (WHC-SD-WM-TP-285) Tank 241-C-101 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994.

31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005132. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-C-101.

1588 (WHC-SD-WM-TP-285-Rev.1) Tank 241-C-101: Tank characterization plan. Revision 1. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009145. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the characterization program, sampling operations, and WHC 222-S Laboratory. Scope of this plan is to provide guidance for sampling and analysis of samples for tank 241-C-101. The sampling type has been changed from push mode core sampling to auger sampling.

1589 (WHC-SD-WM-TP-286) Tank 241-AP-107 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005296. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-AP-107.

1590 (WHC-SD-WM-TP-286-Rev.1) Tank 241-AP-107 tank characterization plan. Revision 1. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 20 Jan 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005978. Source: OSTI; NTIS; INIS; GPO Dep.

Defense Nuclear Facilities Safety Board has directed the DOE to concentrate near-term sampling and analysis activities on identification and resolution of issues (Conway 1993). The Data Quality Objective (DQO) process was chosen as a tool to be used in the resolution of safety issues. As a result, a revision in the Federal Facilities Agreement and Consent Order (Tri-Party Agreement) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process; Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for the tank 241-AP-107 (AP-107).

1591 (WHC-SD-WM-TP-288) Tank 241-U-103 tank characterization plan. Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006898. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-U-103.

1592 (WHC-SD-WM-TP-289) Tank 241-U-105 tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 3 Feb 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007793. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-U-105.

1593 (WHC-SD-WM-TP-290) Tank 241-C-107 tank characterization plan. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Feb 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007175. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the US Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement or TPA) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for the Tank 241-C-107 (C-107) sampling activities. Currently tank C-107 is categorized as a sound, low-heat load tank with partial isolation completed in December 1982. The tank is awaiting stabilization. Tank C-107 is expected to contain three primary layers of waste. The bottom layer should contain a mixture of the following wastes: ion exchange, concentrated phosphate waste from N-Reactor, Hanford Lab Operations, strontium semi-works, Battelle Northwest, 1C, TBP waste, cladding waste, and the hot semi-works. The middle layer should contain strontium recovery supernate. The upper layer should consist of non-complexed waste.

1594 (WHC-SD-WM-TP-293) Tank 241-TX-105 tank characterization plan. Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004978. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, Oak Ridge National Laboratory, and PNL tank vapor program. The

scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-TX-105.

1595 (WHC-SD-WM-TP-294) Test plan for qualification of the S-type fiberglass materials for use as the liquid observation well casing. Parra, S.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005604. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan presents the guidelines and requirements for acceptance of the S-type fiberglass material for use as the liquid observation well casing material. The plan for evaluating the physical properties of the candidate fiberglass materials when subjected to radiation, corrosive chemicals, and high temperatures typically found in the waste tanks are outlined. The tests also include tube connection evaluations. Finally, the test plan identifies the participants, their responsibilities, and the schedule for completion of the work.

1596 (WHC-SD-WM-TP-295) Tank 241-T-107 tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 5 Jan 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005637. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-T-107.

1597 (WHC-SD-WM-TP-296) Tank 241-BX-104 tank characterization plan. Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005070. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-BX-104.

1598 (WHC-SD-WM-TP-297) Test plan 241-C-103 natural breathing characteristics evaluation using the ultra sensitive flowmeter. Hertelendy, N.A. Westinghouse Hanford Co., Richland, WA (United States). 13 Feb 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008045. Source: OSTI; INIS; NTIS; GPO Dep.

To facilitate the reduction of worker exposure to hazardous fumes and vapors, it is imperative to characterize and measure flows out of waste tanks that breathe due to atmospheric pressure changes. These measurements will lead to a better understanding of how these tanks breathe and thus will aid in better worker exposure control at lower cost.

1599 (WHC-SD-WM-TP-298) 241-BY-106 sampling test plan. Bogen, G.J. Westinghouse Hanford Co., Richland, WA (United States). 18 Jan 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005976. Source: OSTI; NTIS; INIS; GPO Dep.

This plan outlines the approach to be taken on obtaining the second core from 241-BY-106, riser 10B, using the Rotary Mode Core Sample Truck (RMCST). The purpose for obtaining the second core is to retrieve the final segments to determine ferrocyanide content. The first core acquired from riser 10B resulted in inadequate sample recovery for the labs to perform the required analysis. Thirteen samples were taken, with recovery varying from 0 to 100%. The most likely contributors to poor sample recovery have been identified and explained on a sample-by sample basis as outlined in this report. This information has been used to devise the approach to be taken in obtaining the second core.

1600 (WHC-SD-WM-TP-299) Tank 241-TY-101 Tank Characterization Plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010085. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-TY-101.

1601 (WHC-SD-WM-TP-300) Tank 241-TY-103 Tank Characterization Plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 16 Mar 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010071. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-TY-103.

1602 (WHC-SD-WM-TP-301) Tank 241-TY-104 Tank characterization plan. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 15 Feb 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008043. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-C Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-TY-104.

1603 (WHC-SD-WM-TP-302) Tank 241-B-112 tank characterization plan. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Feb 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007180. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the US Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal

Facility Agreement and Consent Order (Tri-Party Agreement or TPA) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for tank 241-B-112 (B-112). Tank B-112 is currently a non-Watch List tank; therefore, the only applicable DQO as of January 1995 is the Tank Safety Screening Data Quality Objective, which is described below. Tank B-112 is expected to have three primary layers. A bottom layer of sludge consisting of second-cycle waste, followed by a layer of BY saltcake and a top layer of supernate.

1604 (WHC-SD-WM-TP-304) Tank 241-C-201: Tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008895. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. Scope of this plan is to provide guidance for sampling and analysis of samples for tank 241-C-201.

1605 (WHC-SD-WM-TP-305) Tank 241-C-202: Tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008876. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. Scope of this plan is to provide guidance for sampling and analysis of samples for tank 241-C-202.

1606 (WHC-SD-WM-TP-306) Tank 241-C-203: Tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008877. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. Scope of this plan is to provide guidance for sampling and analysis of samples for tank 241-C-203.

1607 (WHC-SD-WM-TP-307) Tank 241-C-204 Tank Characterization Plan. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008889. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. Scope of this plan is to provide guidance for sampling and analysis of samples for tank 241-C-204.

1608 (WHC-SD-WM-TP-308) Tank 241-U-201 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008416. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 22-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-U-201.

1609 (WHC-SD-WM-TP-309) Tank 241-U-202 tank characterization plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008415. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-U-202.

1610 (WHC-SD-WM-TP-310) Tank 241-U-203: Tank Characterization Plan. Sathyanarayana, P. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 27 Mar 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010138. Source: OSTI; NTIS; INIS; GPO Dep.

The revised Federal Facility Agreement and Consent Order states that a tank characterization plan will be developed for each double-shell tank and single-shell tank using the data quality objective process. The plans are intended to allow users and regulators to ensure their needs will be met and resources are devoted to gaining only necessary information. This document satisfies that requirement for Tank 241-U-203 sampling activities.

1611 (WHC-SD-WM-TP-311) Tank 241-U-204 tank characterization plan. Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010101. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the tank characterization plan for Tank 241-U-204 located in the 200 Area Tank Farm on the Hanford Reservation in Richland, Washington. This plan describes Data Quality Objectives (DQO) and presents historical information and scheduled sampling events for tank 241-U-204.

1612 (WHC-SD-WM-TP-312) Tank 241-TY-106 Tank Characterization Plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 22 Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008417. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-TY-106.

1613 (WHC-SD-WM-TP-313) Tank 241-SX-103 tank characterization plan. Homi, C.S. Westinghouse Hanford

Co., Richland, WA (United States). 8 Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008804. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-SX-103.

1614 (WHC-SD-WM-TP-314) Tank 241-SX-106 tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008837. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-SX-106.

1615 (WHC-SD-WM-TP-317) Tank 241-S-111: Tank characterization plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008878. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, ORNL, and PNL tank vapor program. Scope of this plan is to provide guidance for sampling and analysis of vapor samples from tank 241-S-111 (this tank is on the organic and flammable gas watch list). This tank received Redox plant waste, among other wastes.

1616 (WHC-SD-WM-TP-324) Tank 241-SX-113 Tank Characterization Plan. Sasaki, L.M. Westinghouse Hanford Co., Richland, WA (United States). 7 Apr 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010808. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Project, Sampling Operations, and WHC 222-S Laboratory. Scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-SX-113.

1617 (WHC-SD-WM-TP-335) Vapor sampling and analysis plan. Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010940. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from both SST and DST tanks.

1618 (WHC-SD-WM-TP-338) Tank 241-BX-109 tank characterization plan. Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States).

17 Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010078. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process". This document satisfies that requirement for Tank 241-BX-109 (BX-109) sampling activities. Tank BX-109 is identified as a low-heat load tank, is passively ventilated, and is classified as sound with respect to tank integrity. The tanks as interim stabilized in September 1990 and partial interim isolation has been completed. As of January 1995, approximately 730 kL (193 kgal) of sludge was contained in the tank; of which 49 kL (13 kgal) was drainable interstitial liquid. Single-shell Tank BX-109 was constructed as a first generation type 2 tank between 1946 and 1947 and is located in the 200 East Area. Tank BX-109 is expected to have one primary layer. A sludge layer composed of first-cycle waste and uranium recovery waste. An estimated inventory based on historical sample and analysis data is shown in a table.

1619 (WHC-SD-WM-TP-349) Tank 241-B-104 tank characterization plan. Jo, J. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 13 Apr 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010589. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process". This document satisfies that requirement for tank 241-B-104 (B-104) sampling activities. Tank B-104 is identified as a low-heat load non-Watch List tank, that is passively ventilated, and is categorized as sound with interim stabilization and intrusion prevention completed. It entered service in August 1946 and as of December 31, 1994, it stored 1,404 kL of non-complexed waste, which corresponds to a depth of 330 cm. The waste is comprised of 3.9 kL of supernatant; 230 kL of saltcake; 340 kL of unknown waste; and 829 kL of sludge which includes 151 kL of pumpable liquid remaining. Tank B-104 is expected to have two primary layers. A bottom sludge layer composed of first-cycle, second-cycle, and unknown waste, followed by a top layer of saltcake.

1620 (WHC-SD-WM-TPI-016-Rev.2) Level maintenance for Tank 101-SY mitigation-by-mixing test. Revision 2. Larsen, D.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95001410. Source: OSTI; NTIS; INIS; GPO Dep.

The Phase A, Phase B and Full Scale testing portions of the Mitigation-By-Mixing Test have demonstrated the effectiveness of the Mixer Pump to maintain the waste in tank 101-SY in the desired mitigated state. The operation of the 101-SY Mixer Pump for short periods of time results in a controlled release of hydrogen gas in concentrations well below the established safety limits. Additionally, it has been shown that operation of the pump on a regular schedule minimizes the historical generation rate of hydrogen inventory in the waste. Generation of hydrogen inventory is exhibited by waste level growth. The primary objective of this procedure is to maintain the waste level in tank 241-SY-101 within the safe operating range as defined by the Safety Assessment and the Test Plan. The secondary objective is to operate the pump on a schedule that maximizes its useful lifespan and prevents the formation of obstructions in the normal flow path of the pump.

1621 (WHC-SD-WM-TPI-016-Rev.3) Level maintenance for Tank 101-SY mitigation-by-mixing test. Sobocinski, R.G. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005145. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the procedure to be followed to implement the requirements of the Mixer Pump Long-Term Operations Plan for Tank 241-SY-101 Mitigation, WHC-SD-WM-PLN-081. The test is divided into 2 distinct sequences, named Single Position Pump Run and Tank Sweep. Instructions for all sequences are defined within the procedure. All safety requirements as defined in LA-UR-92-3196, A Safety Assessment for Proposed Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-101-SY have been implemented into this procedure.

1622 (WHC-SD-WM-TPI-017) Instructions for 104-SX liquid level measurement field tests. Webb, R.H. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000457. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides detailed instructions for field testing a suggested solution of inserting a liner inside the 104-SX failed Liquid Observation Well to gain access for making temporary Liquid Level Measurement until a permanent solution has been provided.

1623 (WHC-SD-WM-TRP-105-Rev.5) TMACS Test Procedure TP001: Alarm Management. Scanlan, P.K. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000533. Source: OSTI; NTIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure tests the TMACS Alarm management functions.

1624 (WHC-SD-WM-TRP-105-Rev.6) TMACS test procedure TP001: Alarm management: Revision 6. Scanlan, P.K. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 40p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000352. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure addresses the Alarm Management requirements of the TMACS. The features to be tested are: real-time alarming on high and low level and discrete alarms, equipment alarms, dead-band filtering, alarm display color coding, alarm acknowledgement, and alarm logging.

1625 (WHC-SD-WM-TRP-106-Rev.5) TMACS Test Procedure TP002: Trending. Scanlan, P.K. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000454. Source: OSTI; NTIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure tests the TMACS Trending functions.

1626 (WHC-SD-WM-TRP-106-Rev.6) TMACS Test Procedure TP002: Trending. Scanlan, P.K. Westinghouse Hanford Co., Richland, WA (United States). 29 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000337. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure tests the TMACS Trending functions.

1627 (WHC-SD-WM-TRP-107-Rev.5) TMACS test procedure TP003: Graphics: Revision 5. Scanlan, P.K. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000453. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure addresses the graphics requirements of the TMACS. The features to be tested are the data display graphics and the graphic elements that provide for operator control and selection of displays.

1628 (WHC-SD-WM-TRP-107-Rev.6) TMACS test procedure TP003: Graphics: Revision 6. Scanlan, P.K.; Washburn, S. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000340. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure addresses the

graphics requirements of the TMACS. The features to be tested are the data display graphics and the graphic elements that provide for operator control and selection of displays.

1629 (WHC-SD-WM-TRP-108-Rev.4) **TMACS test procedure TP004: Reporting: Revision 4.** Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000452. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure addressed the report generation capability of the TMACS. The features to be tested are generation of the alarm history report, equipment failure report, single-shell tank report and double-shell tank report.

1630 (WHC-SD-WM-TRP-109-Rev.4) **TMACS test procedure TP005: Sensor configuration, logging, and data conversion: Revision 4.** Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000451. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure addresses the sensor configuration, conversion and logging requirements of the TMACS. The features to be tested are as follows: sensor configuration data; conversion of continuous sensor data to engineering units; conversion of digital data to discrete states; discrete sensor data logging; and continuous sensor data logging.

1631 (WHC-SD-WM-TRP-109-Rev.5) **TMACS Test Procedure TP005: Sensor configuration, logging, and data conversion.** Washburn, S.J. Westinghouse Hanford Co., Shippingport, PA (United States). 29 Aug 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000339. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes.

1632 (WHC-SD-WM-TRP-111-Rev.5) **TMACS Test Procedure TP007: System administration.** Scanlan, P.; Washburn, S.; Seghers, R. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001233. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure tests the TMACS System Administration functions.

1633 (WHC-SD-WM-TRP-112-Rev.5) **TMACS Test Procedure TP008: SACS Interface: Revision 5.** Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001236. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure tests the TMACS SACS Interface functions.

1634 (WHC-SD-WM-TRP-113-Rev.4) **TMACS Test Procedure TP009: Acromag Driver.** Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001235. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure tests the TMACS Acromag Software Driver (Bridge Code).

1635 (WHC-SD-WM-TRP-113-Rev.5) **TMACS test procedure TP009: Acromag driver: Revision 5.** Bass, R.B.; Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000311. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure addresses the testing of the functionality of the TMACS Acromag driver software in conjunction with a new bridge for the Panalarm Annunciator system.

1636 (WHC-SD-WM-TRP-114-Rev.5) **TMACS Test Procedure TP010: Integration summary. Revision 5.** Spurling, D.G. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001228. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes.

1637 (WHC-SD-WM-TRP-114-Rev.6) **TMACS test procedure TP010: Integration summary: Revision 6.** Spurling, D.G. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000306. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Project Test Procedures translate the project's acceptance criteria into test steps. Software releases are certified when the affected Test Procedures are successfully performed and the customers authorize installation of these changes. This Test Procedure verifies that

Test Procedures 1, 2, 3, 5 and 9 (WHC-SD-WM-TRP-105, 106, 107, 109 and 113) of TMACS Software Release 4.1 have been successfully completed.

1638 (WHC-SD-WM-TRP-201) TMACS Test Procedure TP011: Panalarm Interface. Seghers, R.; Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001234. Source: OSTI; NTIS; INIS; GPO Dep.

The TMACS Software Test Procedures translate the project's acceptance criteria into test steps. The TMACS Test Plan (WHC-SD-WM-TP-148) is fulfilled when all Test Cases are approved. This Test Procedure tests the TMACS Panalarm Interface functions.

1639 (WHC-SD-WM-TRP-202) TMACS test procedure TP012: Panalarm software bridge. Washburn, S.J. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001163. Source: OSTI; NTIS; INIS; GPO Dep.

This Test Procedure addresses the testing of the functionality of the Tank Monitor and Control System (TMACS) Panalarm bridge software. The features to be tested are: Bridge Initialization Options; Bridge Communication; Bridge Performance; Testing Checksum Errors; and Testing Command Reject Errors. Only the first three could be tested; the last two have been deferred to a later date.

1640 (WHC-SD-WM-TRP-208) RGA-5 process gas analyzer test report. Weamer, J.L. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003773. Source: OSTI; NTIS; INIS; GPO Dep.

The gas monitoring system, GMS-2, includes two gas monitors. GC-2 measures high hydrogen concentrations (0.2–10%) and GC-3 measures the lower concentration levels (10–100 ppm). Although redundant instruments are in place for accurately measuring the higher hydrogen concentrations, there are no redundant instruments to accurately measure the relatively low baseline hydrogen concentrations. The RGA-5 process gas analyzer is a two-column GC that will replace GC-2 and provide redundancy for GC-3. This upgrade will provide faster response time and reduce tank farm entries for routine operations because the RGA-5 is remotely operable. Tests were conducted according to WHC-SD-WM-TP-262, RGA-5 Process Gas Analyzer Test Plan. The first objective was to verify that the vendor-supplied RGA host data acquisition software allowed communication between the RGA-5 and an ISA bus personal computer. The second objective was to determine the capabilities of the RGA-5 process gas analyzer. The tests did the following: with a constant flow rate and pressure, determined the concentration range that each column can accurately and precisely measure; identified any uncorrected interferences from other tank gases such as ammonia, nitrous oxide, or methane; and determined the response and decay time.

1641 (WHC-SD-WM-TRP-209) Test report for initial test of 6266 Building filter assemblies. Prather, M.C. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000309. Source: OSTI; NTIS; GPO Dep.

This is the test report for the initial test of the Waste Sampling and Characterization Facility (WSCF) 6266 Building high efficiency particulate air (HEPA) filter assemblies. This supports the start-up of WSCF.

1642 (WHC-SD-WM-TRP-211) Mitigation of hydrogen by oxidation using nitrous oxide and noble metal catalysts. Britton, M.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005979. Source: OSTI; NTIS; INIS; GPO Dep.

This test studied the ability of a blend of nuclear-grade, noble-metal catalysts to catalyze a hydrogen/nitrous oxide reaction in an effort to mitigate a potential hydrogen (H_2) gas buildup in the Hanford Site Grout Disposal Facility. For gases having H_2 and a stoichiometric excess of either nitrous oxide or oxygen, the catalyst blend can effectively catalyze the H_2 oxidation reaction at a rate exceeding 380 μ moles of H_2 per hour per gram of catalyst (μ mol/h/g) and leave the gas with less than a 0.15 residual H_2 concentration. This holds true in gases with up to 2.25% water vapor and 0.1% methane. This should also hold true for gases with up to 0.1% carbon monoxide (CO) but only until the catalyst is exposed to enough CO to block the catalytic sites and stop the reaction. Gases with ammonia up to 1% may be slightly inhibited but can have reaction rates greater than 250 μ mol/h/g with less than a 0.20% residual H_2 concentration. The mechanism for CO poisoning of the catalyst is the chemisorption of CO to the active catalyst sites. The CO sorption capacity (SC) of the catalyst is the total amount of CO that the catalyst will chemisorb. The average SC for virgin catalyst was determined to be 19.3 ± 2.0 μ moles of CO chemisorbed to each gram of catalyst (μ mol/g). The average SC for catalyst regenerated with air was 17.3 ± 1.9 μ mol/g.

1643 (WHC-SD-WM-TRP-215) Ferrocyanide safety program: Results of relative humidity experiments using ferrocyanide waste simulants. King, C.V. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001372. Source: OSTI; NTIS; INIS; GPO Dep.

To be categorized as conditionally safe, ferrocyanide tanks containing ≥ 8 wt% $Na_2NiFe(CN)_6$ on an energy equivalent basis (i.e., ≥ 115 cal/g) are required to contain some amount of water. These tests were conducted to determine the equilibrium moisture content of waste simulant at the conditions of 30% relative humidity and 25°C. This test report was prepared to disseminate data collected from these tests. These data are used to model the waste tank moisture contents and transport. These models can determine if the moisture in these tanks will drop below the defined safety limits.

1644 (WHC-SD-WM-TRP-218) Application of infrared imaging in ferrocyanide tanks. Morris, K.L.; Mailhot, R.B. Jr.; McLaren, J.M.; Morris, K.L. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001574. Source: OSTI; NTIS; INIS; GPO Dep.

This report analyzes the feasibility of using infrared imaging techniques and scanning equipment to detect potential hot spots within ferrocyanide waste tanks at the Hanford Site. A hot spot is defined as a volumetric region within a waste tank with an excessively warm temperature that is generated by radioactive isotopes. The thermal image of a

hot spot was modeled by computer. this model determined the image an IR system must detect. Laboratory and field tests of the imaging system are described, and conclusions based on laboratory and field data are presented. The report shows that infrared imaging is capable of detecting hot spots in ferrocyanide waste tanks with depths of up to 3.94 m (155 in.). The infrared imaging system is a useful technology for initial evaluation and assessment of hot spots in the majority of ferrocyanide waste tanks at the Hanford Site. The system will not allow an exact hot spot and temperature determination, but it will provide the necessary information to determine the worst-case hot spot detected in temperature patterns. Ferrocyanide tanks are one type of storage tank on the Watch List. These tanks are identified as priority 1 Hanford Site Tank farm Safety Issues.

1645 (WHC-SD-WM-TRP-223) MWTF jumper connector integral seal block development and leak testing. Ruff, E.S.; Jordan, S.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 478p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009159. Source: OSTI; NTIS; INIS; GPO Dep.

In fiscal year 1993, tests of an o-ring/tetraseal retainer designed to replace a gasket-type seal used in PUREX-type process jumper connectors encouraged the design of an improved seal block. This new seal block combines several parts into one unitized component called an integral seal block. This report summarizes development and leak testing of the new integral seal block. The integral seal block uses a standard o-ring nested in a groove to accomplish leak tightness. This seal block eliminates the need to machine acme threads into the lower skirt casting and seal retainers, eliminates tolerance stack-up, reduces parts inventory, and eliminates an unnecessary leak path in the jumper connector assembly. This report also includes test data on various types of o-ring materials subjected to heat and pressure. Materials tested included Viton, Kalrez, and fluorosilicone, with some incidental data on teflon coated silicone o-rings. Test experience clearly demonstrates the need to test each seal material for temperature and pressure in its intended application. Some materials advertised as being "better" at higher temperatures did not perform up to expectations. Inspection of the fluorosilicone and Kalrez seals after thermal testing indicates that they are much more susceptible to heat softening than Viton.

1646 (WHC-SD-WM-TRP-225) Test results of the Phase 1 Test Plan. Hey, B.E. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008424. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive waste materials in underground high level waste (HLW) storage tanks at the Hanford Site evolve gaseous mixtures at varying rates. In order to verify the flammability of these gases and the mechanisms by which they are produced, it is necessary to sample material from these tanks in such a way as to preserve the gas phase of the material for analysis. Careful laboratory studies could then be performed on these samples which would allow judgement to be made of the hazard level of the storage tank. The Retained Gas Sampler (RGS) system is such a sampling method. A multidisciplinary team developed and issued a plan to obtain waste tank core samples for gas phase analysis. This plan contained the basic idea and function of the RGS system. Different organizations assumed

responsibility of various aspects of the RGS program which they were most qualified to develop.

1647 (WHC-SD-WM-TRP-229) Test report - Prototype core sampler. Linschooten, C.G. Westinghouse Hanford Co., Richland, WA (United States). 17 Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005987. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test is to determine the adequacy of the prototype sampler, provided to Westinghouse Hanford Company (WHC) by DOE-RL. The sampler was fabricated for DOE-RL by the Concord Company by request of DOE-RL. This prototype sampler was introduced as a technology that can be easily deployed (similar to the current auger system) and will reliably collect representative samples. The sampler is similar to the Universal Sampler i.e., smooth core barrel and piston with an O-ring seal, but lacks a rotary valve near the throat of the sampler. This makes the sampler inappropriate for liquid sampling, but reduces the outside diameter of the sampler considerably, which should improve sample recovery. Recovery testing was performed with the supplied sampler in three different consistencies of Kaolin sludge simulants.

1648 (WHC-SD-WM-TRP-230) Test report for slow rotation core sampling test. Ralston, G.L. Westinghouse Hanford Co., Richland, WA (United States). 3 Apr 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010102. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the temperature increase experienced when core sampling equipment is rotated slowly with a relatively low downforce applied to the drill string (nominal 10 rpm/400 lb downforce). The test was carried out in close to worst-case conditions, rotating against a cement mixture in one test sequence, and a steel plate in the second test sequence.

1649 (WHC-SD-WM-UM-029) 241-A evaporator flow-sheet users manual. Larrick, A.P. Westinghouse Hanford Co., Richland, WA (United States). 22 Dec 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005147. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document presents a description of the 242-A Evaporator flowsheet. Material balances are calculated for feed, slurry, and effluent streams based on input data for the feed stream.

1650 (WHC-SD-WM-VI-017) 241-SX Fan driver sheave replacement. Filkowski, R.V. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008412. Source: OSTI; NTIS; INIS; GPO Dep.

This SD documents revision of CVI 17443 which changes the type of motor sheaves driving the K1 fans in SX farm. This revision documents changing the driver (motor) sheave from a variable pitch to a fixed sheave. The drive sheave is changed in response to a recommendation from the Equipment Condition Monitoring Group. Changing the variable pitch sheave to a fixed pitch sheave is expected to reduce the vibration of the fan which will prolong the life of the equipment.

1651 (WHC-SD-WM-VI-018) Test plan for glass melter system technologies for vitrification of high-sodium content low-level radioactive liquid waste, Project No. RDD-43288. Higley, B.A. Westinghouse Hanford Co., Richland, WA (United States). 15 Mar 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009141. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a test plan for the conduct of combustion fired cyclone vitrification testing by a vendor in support of the Hanford Tank Waste Remediation System, Low-Level Waste Vitrification Program. The vendor providing this test plan and conducting the work detailed within it is the Babcock & Wilcox Company Alliance Research Center in Alliance, Ohio. This vendor is one of seven selected for glass melter testing.

1652 (WHC-SD-WM-WP-072-Rev.3) Engineering drawing field verification program: Revision 3. Ulk, P.F. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002097. Source: OSTI; NTIS; INIS; GPO Dep.

Safe, efficient operation of waste tank farm facilities is dependent in part upon the availability of accurate, up-to-date plant drawings. Accurate plant drawings are also required in support of facility upgrades and future engineering remediation projects. This supporting document establishes the procedure for performing a visual field verification of engineering drawings, the degree of visual observation being performed and documenting the results. A copy of the drawing attesting to the degree of visual observation will be paginated into the released Engineering Change Notice (ECN) documenting the field verification for future retrieval and reference. All waste tank farm essential and support drawings within the scope of this program will be converted from manual to computer aided drafting (CAD) drawings. A permanent reference to the field verification status will be placed along the right border of the CAD-converted drawing, referencing the revision level, at which the visual verification was performed and documented.

1653 (WHC-SD-WM-WP-132-Rev.4) Tank farm instrumentation and data acquisition/management upgrade plan. Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 28p. DOE Contract AC06-87RL10930. Order Number DE95001515. Source: OSTI; NTIS; INIS; GPO Dep.

This plan provides the strategy, implementation, and schedule for upgrading tank farm instrumentation, data acquisition and data management. The focus is on surveillance parameters to verify and maintain tank safety. The criteria do not necessarily constitute mandatory requirements but are based upon engineering judgement and best available information. Schedules reflect preliminary funding for FY95. For out years they are best engineering judgment.

1654 (WHC-SD-WM-WP-132-Rev.5) Tank Farm Instrumentation and Data Acquisition/Management Upgrade Plan. Revision 5. Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 27 Mar 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010059. Source: OSTI; NTIS; INIS; GPO Dep.

This plan provides the strategy, implementation, and schedule for upgrading tank farm instrumentation, data

acquisition and data management. The focus is on surveillance parameters to verify and maintain tank safety. The criteria do not necessarily constitute mandatory requirements but are based upon engineering judgment and best available information. Schedules reflect current funding for FY95. For out years they are best engineering judgment.

1655 (WHC-SD-WM-WP-174-Rev.1) Engineering work plan for tank 241-C-103 vapor phase characterization (ECN 613188). Revision 1. Conrad, R.B. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002157. Source: OSTI; NTIS; GPO Dep.

The tasks described by this work plan have been completed. The purpose of this revision is to document what actually occurred during the performance of this work plan. The scope was and is limited to phases 1 and 2 as described in the program plan, revision 1. Phases 1 and 2 include the tank 241-C-103 (C-103) vapor. For economic and as low as reasonably achievable (ALARA) reasons, we will limit our scope to characterize the C-103 vapor phase for the categories that could be expected to impact facility worker safety from a toxicological and flammability standpoint. In anticipation that a vapor treatment system may be required, categories necessary for design will also be included. It will be the intent of the C-103 vapor characterization program to: (1) identify the substances from the above list of categories that are applicable to the issues involving C-103, and (2) implement a phased plan which will develop the organic vapor phase characterization method and then characterize the organics and the other selected substances to the required quantitative certainty.

1656 (WHC-SD-WM-WP-218-Rev.1) Work plan for upgrading the 241-A-701 compressed air system and motor control center. Revision 1. Carpenter, K.E. Westinghouse Hanford Co., Richland, WA (United States). 17 Jan 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005990. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan will outline the responsibilities associated with the 241-A-701 Compressed Air System (CAS) and Motor Control Center (MCC) upgrades. All activities required to design, install, test, and operate the modified systems are addressed in this document. Upgrades Technical Support (UTS) of TWRS Engineering is responsible for the completion of all tasks associated with this upgrade. UTS will coordinate the upgrade activities, and ensure all tasks are successfully completed on or before the scheduled dates. The primary objective of the 241-A-701 Compressor and MCC Upgrade is to provide a reliable source of process and instrument compressed air to the A, AX, AY, and AZ tank farms.

1657 (WHC-SD-WM-WP-264) Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1). McClees, J.; Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002074. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this effort is to transfer operating and maintenance responsibility for the 241-SY-101 data acquisition and control system (DACS-1) from Los Alamos National Laboratory to Westinghouse Hanford Company. This work

plan defines the tasks required for a successful turnover. It identifies DACS-1 transition, deliverables, responsible organizations and individuals, interfaces, cost, and schedule. The transition plan will discuss all required hardware, software, documentation, maintenance, operations, and training for use at Hanford Waste Tank 241-SY-101. The transfer of responsibilities for DACS-1 to WHC is contingent on final approval of applicable Acceptance for Beneficial Use documentation by Waste Tank Operations. The DACS-1 was designed to provide data monitoring, display, and storage for Tank 241-SY-101. The DACS-1 also provides alarm and control of all the hydrogen mitigation testing systems, as well as ancillary systems and equipment (HVAC, UPS, etc.) required to achieve safe and reliable operation of the testing systems in the tank.

1658 (WHC-SD-WM-WP-283) Work plan, AP-102 mixer pump removal and pump replacement. Jimenez, R.F. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000502. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this work plan is to plan the steps and estimate the costs required to remove the failed AP-102 mixer pump, and to plan and estimate the cost of the necessary design and specification work required to order a new, but modified, mixer pump including the pump and pump pit energy absorbing design. The main hardware required for the removal of the mixer is as follows: a flexible receiver and blast shield; a metal container for the pulled mixer pump; and a trailer and strongback to haul and manipulate the container. Additionally: a gamma scanning device will be needed to detect the radioactivity emanating from the mixer as it is pulled from the tank; a water spray system will be required to remove tank waste from the surface of the mixer as it is pulled from the AP-102 tank; and a lifting yoke to lift the mixer from the pump pit (the SY-101 Mixer Lifting Yoke will be used). A "green house" will have to be erected over the AP-102 pump pit and an experienced Hoisting and Rigging crew must be assembled and trained in mixer pump removal methods before the actual removal is undertaken.

1659 (WHC-SD-WM-WP-284) Work plan for upgrade of SY-101 Hydrogen Mitigation Test Project Data Acquisition and Control System (DACS-1). Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004971. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this effort is to upgrade the existing DACS-1 used for control and data acquisition in support of the hydrogen mitigation program for tank 101-SY. The planned upgrades will enhance the system capabilities to support additional mitigation projects and improve the system operability by implementing changes identified during operation of the system to date. Once the upgrades have been implemented, the DACS-1 system should operate as it did prior to the upgrade, but with greatly increased speed and capability. No retraining of Test Engineers will be required; the upgrade is designed to be transparent to those who operate it, with only a noticeable increase in the speed of the system. This work plan defines the tasks required for implementing the upgrade. It identifies deliverables, responsible organizations and individuals, interfaces, and schedule. This upgrade effort employs system engineering principles wherever applicable.

1660 (WHC-SD-WM-WP-285) TWRS Systems Engineering Working Plan. Eiholzer, C.R. Westinghouse Hanford Co., Richland, WA (United States). 16 Sep 1994. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001004. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Systems Engineering (SE) Working Plan (SEWP) is to describe how the Westinghouse Hanford Company (WHC) Tank Waste Remediation System (TWRS) will implement the SE policy and guidance provided in the Tank Waste Remediation System (TWRS) Systems Engineering Management Plan (SEMP). Sections 2.0 through 4.0 cover how the SE process and management will be performed to develop a technical baseline within TWRS. Section 5.0 covers the plans and schedules to implement the SE process and management within TWRS. Detailed information contained in the TWRS Program SEMP is not repeated in this document. This SEWP and the SE discipline defined within apply to the TWRS Program and new and ongoing TWRS projects or activities, including new facilities and safety. The SE process will be applied to the existing Tank Farm operations where the Richland TWRS Program Office management determines the process appropriate and where value will be added to existing Tank Farm system and operations.

1661 (WHC-SD-WM-WP-287) Work plan for SY Farm Integrated Data Acquisition and Control System (DACS-2a). Conner, R.P.; Katz, R.S. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002459. Source: OSTI; NTIS; INIS; GPO Dep.

The SY Farm currently has a temporary Data Acquisition & Control System (DACS) housed in a mobile trailer. The system is currently referred to as DACS-1. It was designed and configured to support engineers and scientists conducting the special performance evaluation and testing program for the safety mitigation test equipment located in waste tank 241-SY-101 (101-SY). It is currently being maintained and utilized by engineering personnel to monitor and control the 101-SY mitigation pump activities. Based upon the results of the mitigation testing program, some of the temporary test mitigation equipment (such as mixing pump) will be replaced with longer-term "operational" mitigation equipment. This is resulting in new requirements for the Data Acquisition and Control System which will be full-filled by a newer control facility referred to as the DACS-2. A teaming between Westinghouse Hanford Company (WHC) and Los Alamos National Laboratory (LANL) has been established for the SY farm mitigation program in order to develop and implement the "next generation" of the data acquisition and control system for the mitigation pump operations. The new system will be configured for use by the tank farm operational personnel. It will support the routine operations necessary for safety mitigation and the future waste retrieval of Project W-211. It is intended to replace the existing DACS-1 and provide the necessary control room space for future integration of W-211.

1662 (WHC-SD-WM-WP-289) Engineering work plan for container venting system drill press assembly troubleshooting. Prather, M.C. Westinghouse Hanford Co., Richland, WA (United States). 7 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003226. Source: OSTI; NTIS; GPO Dep.

Engineering drawings for this project are identified as CAPE-3103. Inquiries may be directed to: Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831.

A drill press assembly has been fabricated for the Container Venting System (CVS). The drill bit assembly has bound in the press plate in previous revisions of this design. This work plan is for troubleshooting the current drill press to ensure that it doesn't bind.

1663 (WHC-SD-WM-WP-289-Rev.1) Engineering work plan for container venting system drill press assembly troubleshooting. Revision 1. Prather, M.C. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003992. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan is for troubleshooting the current CVS drill press to ensure that the drill bit assembly doesn't bind in the press plate. A drill press assembly has been fabricated for the Container Venting System (CVS). The drill bit assembly has bound in the press plate in previous revisions of this design. Initial troubleshooting of the drill press per Rev. 0 of this work plan was performed at the 200W Kaiser Machine Shop under Work Package 2H9401670F, Internal Work Order E20027. The drill press operated without jamming. Then, during the pre-operational test on 11/14/94 and the operational test on 11/17/94, two drum lids were drilled. Immediately after the test on 11/17/94, the drill was again operated, and it jammed. An inspection found shavings at the bottom of the drill bit assembly, between the drill bit sleeve and the press plate bore. This revised work plan provides direction for the machine shop to diagnose and correct this recent problem.

1664 (WHC-SD-WM-WP-291) Work plan for new SY tank farm exhaustor, on-site fabrication activities. McClees, J. Westinghouse Hanford Co., Richland, WA (United States). 22 Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004101. Source: OSTI; NTIS; INIS; GPO Dep.

The replacement SY tank farm exhaustor unit is a new piece of equipment, designed to replace the existing SY tank farm K1 Ventilation System exhaustor unit. This work plan describes the shop fabrication activities associated with the receiving, assembly, repair, modification, and testing of the new SY tank farm primary exhaustor. A general list of these activities include, but are not limited to: repair all shipping damages, including procurement of replacement parts; fabricate hardware needed to install exhaustor in the field (e.g., Vent duct tie-in, duct concrete footings/hangers, stack concrete footings, etc.); incorporate equipment modification as provided by WHC Engineering (e.g., Rewire the Alarm Annunciator Cabinet as fail-safe, connections between the exhaustor and stack sample cabinet, etc.); test the entire exhaustor unit, to the extent possible, prior to field installation; and prepare exhaustor unit for transfer to and installation at SY tank farm.

1665 (WHC-SD-WM-WP-295) Engineering work plan for implementing the Process Condensate Recycle Project at the 242-A evaporator. Haring, D.S. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006787. Source: OSTI; NTIS; INIS; GPO Dep.

The 242-A Evaporator facility is used to reduce the volume of waste stored in the Hanford double shell tanks. This facility uses filtered raw water for cooling, de-entrainment pad sprays, pump seal water, and chemical tank make-up. Some of these uses result in the introduction of filtered raw water into the process, thus increasing the volume of waste requiring evaporation and subsequent treatment by the 200 East Effluent Treatment Facility. The pump seal water and the de-entrainment pad spray systems were identified as candidates for a waste minimization upgrade. This work plan describes the activities associated with the design, installation, testing and initial operation of the process condensate recycle system. Implementation of the process condensate recycle system will permit the use of process condensate in place of raw water for the de-entrainment pad sprays and pump seals. This will reduce the amount of low-level liquid waste and generated during facility operation through source reduction and recycling.

1666 (WHC-SD-WM-WP-301) Work plan for vibration cable re-route and water flush system modifications for 107-AN mixer pump. Leshikar, G.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Apr 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010591. Source: OSTI; NTIS; INIS; GPO Dep.

A mixer pump (75 horsepower Hazleton submersible) is to be installed in the central pump pit of Double-Shell Tank 241-AN-107 for the Caustic Addition Project. The mixer pump will be used as a platform to inject, mix, and entrain caustic with the waste, in order to bring the waste hydroxyl ion concentration into compliance with Tank Farm operating specifications. Testing of the mixer pump and caustic addition system revealed that the mixer pump's vibration cable picks up electromagnetic interference from the motor power cable during variable speed operation of the pump. Also, it was noted that the mixer pump's water flush system may not be as effective as desired. Ergo this work plan for improving the operation of these mixer pump subsystems. A new vibration cable shall be routed entirely outside the mixer pump support column pipe, up thru a new penetration in the pump mounting flange. The existing penetration in the side of the pipe is to be plugged. Increasing the distance between power and instrument cables may reduce or eliminate electromagnetic interference to the vibration monitor. The mixer pump water flush system shall be modified to allow pressure isolation of individual branches. A header is to be installed on the middle section of the support column. Each branch (there are three) shall contain a solenoid valve (normally open) to control flow into the branch. The solenoid cables shall be routed up thru three new penetrations in the pump mounting flange to a new electrical box mounted on the flange. The existing flush piping to the inlet screen will remain but the continuation of the flush piping to the pump discharge nozzles is to be removed and the tee plugged. New stainless steel tubing is to be run down to the pump discharge nozzles. Pressure isolation of individual branches will maximize the flush system's effectiveness at blasting potential sediment clogs out of the pump discharge nozzles.

1667 (WHC-SP-1101-Vol.1) Tank waste remediation system multi-year work plan. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 657p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001023. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Multi-Year Work Plan (MYWP) documents the detailed total Program baseline and was constructed to guide Program execution. The TWRS MYWP is one of two elements that comprise the TWRS Program Management Plan. The TWRS MYWP fulfills the Hanford Site Management System requirement for a Multi-Year Program Plan and a Fiscal-Year Work Plan. The MYWP addresses program vision, mission, objectives, strategy, functions and requirements, risks, decisions, assumptions, constraints, structure, logic, schedule, resource requirements, and waste generation and disposition. Sections 1 through 6, Section 8, and the appendixes provide program-wide information. Section 7 includes a subsection for each of the nine program elements that comprise the TWRS Program. The foundation of any program baseline is base planning data (e.g., defensible product definition, logic, schedules, cost estimates, and bases of estimates). The TWRS Program continues to improve base data. As data improve, so will program element planning, integration between program elements, integration outside of the TWRS Program, and the overall quality of the TWRS MYWP. The MYWP establishes the TWRS baseline objectives to store, treat, and immobilize highly radioactive Hanford waste in an environmentally sound, safe, and cost-effective manner. The TWRS Program will complete the baseline mission in 2040 and will incur costs totalling approximately 40 billion dollars. The summary strategy is to meet the above objectives by using a robust systems engineering effort, placing the highest possible priority on safety and environmental protection; encouraging "out sourcing" of the work to the extent practical; and managing significant but limited resources to move toward final disposition of tank wastes, while openly communicating with all interested stakeholders.

1668 (WHC-SP-1101-Vol.2) Tank waste remediation system multi-year work plan. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 863p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001024. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Multi-Year Work Plan (MYWP) documents the detailed total Program baseline and was constructed to guide Program execution. The TWRS MYWP is one of two elements that comprise the TWRS Program Management Plan. The TWRS MYWP fulfills the Hanford Site Management System requirement for a Multi-Year Program Plan and a Fiscal-Year Work Plan. The MYWP addresses program vision, mission, objectives, strategy, functions and requirements, risks, decisions, assumptions, constraints, structure, logic, schedule, resource requirements, and waste generation and disposition. Sections 1 through 6, Section 8, and the appendixes provide program-wide information. Section 7 includes a subsection for each of the nine program elements that comprise the TWRS Program. The foundation of any program baseline is base planning data (e.g., defensible product definition, logic, schedules, cost estimates, and bases of estimates). The TWRS Program continues to improve base data. As data improve, so will program element planning, integration between program elements, integration outside of the TWRS Program, and the overall quality of the TWRS MYWP. The MYWP establishes the TWRS baseline objectives to store, treat, and immobilize highly radioactive Hanford waste in an environmentally sound, safe, and cost-effective manner. The TWRS Program will complete the baseline mission in 2040 and will incur costs totalling approximately 40 billion dollars. The summary strategy is to meet the above objectives by

using a robust systems engineering effort, placing the highest possible priority on safety and environmental protection; encouraging "out sourcing" of the work to the extent practical; and managing significant but limited resources to move toward final disposition of tank wastes, while openly communicating with all interested stakeholders.

1669 (WHC-SP-1101-Vol.3) Tank waste remediation system multi-year work plan. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 1051p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001025. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Multi-Year Work Plan (MYWP) documents the detailed total Program baseline and was constructed to guide Program execution. The TWRS MYWP is one of two elements that comprise the TWRS Program Management Plan. The TWRS MYWP fulfills the Hanford Site Management System requirement for a Multi-Year Program Plan and a Fiscal-Year Work Plan. The MYWP addresses program vision, mission, objectives, strategy, functions and requirements, risks, decisions, assumptions, constraints, structure, logic, schedule, resource requirements, and waste generation and disposition. Sections 1 through 6, Section 8, and the appendixes provide program-wide information. Section 7 includes a subsection for each of the nine program elements that comprise the TWRS Program. The foundation of any program baseline is base planning data (e.g., defensible product definition, logic, schedules, cost estimates, and bases of estimates). The TWRS Program continues to improve base data. As data improve, so will program element planning, integration between program elements, integration outside of the TWRS Program, and the overall quality of the TWRS MYWP. The MYWP establishes the TWRS baseline objectives to store, treat, and immobilize highly radioactive Hanford waste in an environmentally sound, safe, and cost-effective manner. The TWRS Program will complete the baseline mission in 2040 and will incur costs totalling approximately 40 billion dollars. The summary strategy is to meet the above objectives by using a robust systems engineering effort, placing the highest possible priority on safety and environmental protection; encouraging "out sourcing" of the work to the extent practical; and managing significant but limited resources to move toward final disposition of tank wastes, while openly communicating with all interested stakeholders.

1670 (WHC-SP-1101-Vol.4) Tank waste remediation system multi-year work plan. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 625p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001026. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Multi-Year Work Plan (MYWP) documents the detailed total Program baseline and was constructed to guide Program execution. The TWRS MYWP is one of two elements that comprise the TWRS Program Management Plan. The TWRS MYWP fulfills the Hanford Site Management System requirement for a Multi-Year Program Plan and a Fiscal-Year Work Plan. The MYWP addresses program vision, mission, objectives, strategy, functions and requirements, risks, decisions, assumptions, constraints, structure, logic, schedule, resource requirements, and waste generation and disposition. Sections 1 through 6, Section 8, and the appendixes provide program-wide information. Section 7 includes a subsection for each of the nine program elements that comprise the

TWRS Program. The foundation of any program baseline is base planning data (e.g., defensible product definition, logic, schedules, cost estimates, and bases of estimates). The TWRS Program continues to improve base data. As data improve, so will program element planning, integration between program elements, integration outside of the TWRS Program, and the overall quality of the TWRS MYWP. The MYWP establishes the TWRS baseline objectives to store, treat, and immobilize highly radioactive Hanford waste in an environmentally sound, safe, and cost-effective manner. The TWRS Program will complete the baseline mission in 2040 and will incur costs totalling approximately 40 billion dollars. The summary strategy is to meet the above objectives by using a robust systems engineering effort, placing the highest possible priority on safety and environmental protection; encouraging "out sourcing" of the work to the extent practical; and managing significant but limited resources to move toward final disposition of tank wastes, while openly communicating with all interested stakeholders.

1671 (WHC-SP-1101-Vol.5) Tank waste remediation system multi-year work plan. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 594p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001027. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Multi-Year Work Plan (MYWP) documents the detailed total Program baseline and was constructed to guide Program execution. The TWRS MYWP is one of two elements that comprise the TWRS Program Management Plan. The TWRS MYWP fulfills the Hanford Site Management System requirement for a Multi-Year Program Plan and a Fiscal-Year Work Plan. The MYWP addresses program vision, mission, objectives, strategy, functions and requirements, risks, decisions, assumptions, constraints, structure, logic, schedule, resource requirements, and waste generation and disposition. Sections 1 through 6, Section 8, and the appendixes provide program-wide information. Section 7 includes a subsection for each of the nine program elements that comprise the TWRS Program. The foundation of any program baseline is base planning data (e.g., defensible product definition, logic, schedules, cost estimates, and bases of estimates). The TWRS Program continues to improve base data. As data improve, so will program element planning, integration between program elements, integration outside of the TWRS Program, and the overall quality of the TWRS MYWP. The MYWP establishes the TWRS baseline objectives to store, treat, and immobilize highly radioactive Hanford waste in an environmentally sound, safe, and cost-effective manner. The TWRS Program will complete the baseline mission in 2040 and will incur costs totalling approximately 40 billion dollars. The summary strategy is to meet the above objectives by using a robust systems engineering effort, placing the highest possible priority on safety and environmental protection; encouraging "out sourcing" of the work to the extent practical; and managing significant but limited resources to move toward final disposition of tank wastes, while openly communicating with all interested stakeholders.

1672 (WHC-SP-1137) Preventative maintenance plan for emergency pumping trailers. Wiggins, D.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001528. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose/goal of this document is to identify the maintenance requirements and resources available to properly maintain the readiness and condition of the Emergency Pumping Equipment controlled by the Tank Waste Remediation System Tank Farms Plant Engineering and Tank Stabilization Operations. This equipment is intended to pump a single-shell tank (SST) that has been identified as an assumed leaking tank. The goal is to commence pumping (submersible or jet) as soon as safely possible after identifying a SST as an assumed leaking tank. Important information pertaining to the Emergency Pumping Equipment, Over-Ground Piping installation, and procedures is found in WHC-SD-WM-AP-005, "Single Shell Tank Leak Emergency Pumping Guide."

1673 (WHC-SP-1143) Tank waste remediation system high-level waste feed processability assessment report. Lambert, S.L. (Westinghouse Hanford Co., Richland, WA (United States)); Kim, D.S. (Westinghouse Hanford Co., Richland, WA (United States)). Dec 1994. 279p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008029. Source: OSTI; NTIS; INIS; GPO Dep.

This study evaluates the effect of feed composition on the performance of the high-level vitrification process. It is assumed in this study that the tank wastes are retrieved and blended by tank farms, producing 12 different blends from the single-shell tank farms, two blends of double-shell tank waste, and a separately defined all-tank blend. This blending scenario was chosen only for evaluating the impact of composition on the volume of high-level waste glass produced. Special glass compositions were formulated for each waste blend based on glass property models and the properties of similar glasses. These glasses were formulated to meet the applicable viscosity, electrical conductivity, and liquidus temperature constraints for the identified candidate melters. Candidate melters in this study include the low-temperature stirred melter, which operates at 1050°C; the reference Hanford Waste Vitrification Plant liquid-fed ceramic melter, which operates at 1150°C; and the high-temperature, joule-heated melter and the cold-crucible melter, which operate over a temperature range of 1150°C to 1400°C. In the most conservative case, it is estimated that 61,000 MT of glass will be produced if the Site's high-level wastes are retrieved by tank farms and processed in the reference joule-heated melter. If an all-tank blend was processed under the same conditions, the reference melter would produce 21,250 MT of glass. If cross-tank blending were used, it is anticipated that \$2.0 billion could be saved in repository disposal costs (based on an average disposal cost of \$217,000 per canister) by blending the S, SX, B, and T Tank Farm wastes with other wastes prior to vitrification. General blending among all the tank farms is expected to produce great potential benefit.

1674 (WHC-SP-2332) Infrared scanning of Hanford waste tank S-110 and interpretation of surface temperature variation. Efferding, L.E. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-29: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013232. Source: OSTI; NTIS; INIS; GPO Dep.

An infrared scanner and data interpretation method was developed and applied for surface temperature mapping of heat generating nuclear waste tanks. A surface temperature map of a non-watch list tank (110-S) was selected for

demonstration purposes because it displayed an irregular salt cake surface and contained an operable thermocouple tree that displayed a subsurface temperature gradient. The infrared scanner hardware was successfully operated in a tank environment and necessary data was gathered for application of a proposed data mapping and evaluation method.

1675 (WINCO-1175) Vortex diode jet performance and theory. Houck, E.D. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Dec 1993. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013369. Source: OSTI; NTIS; GPO Dep.

Fluidics is the technology dealing with the use of a flowing liquid or gas in various devices for controls and fluid transfers. Existing fluidic technology transfers fluid at approximately the same rate as air lifts and jets. A vortex diode combined in parallel with a jet (vortex diode jet) produces significantly higher transfer rates and retains the fluidic system advantages. This paper presents the proof of concept research and gives design parameters for the vortex diode jet. The goal of this research was to develop a vortex diode jet that would improve fluidic system transfer rates, and to develop and verify the design equations. Proven design equations could then be used to design, and model vortex diode jet systems. This research has shown that vortex diode jets improve fluidic system transfer rate by up to 60 percent and can be modelled with the design equations.

1676 (WINCO-1212) INEL Radioactive Liquid Waste Management Plan. Collins, J.W.; Swenson, M.C.; White, J.M.; Tripp, J.L.; Miller, K.L.; Park, C.V.; Birrer, S.A.; Knighton, R.B.; Schmidt, D.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). May 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013810. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioactive Liquid Waste Management Team proposes an integrated plan to manage the generation of radioactive liquid waste (RLW) at the Idaho National Engineering Laboratory so that the INEL is a leader in waste management, storage capacity is not exceeded and Notice of Noncompliance (NON) Consent Order is met. The NON Consent Order outlines a compliance schedule which requires discontinuing the use of the five tanks located in pillar and panel vaults by March 31, 2009, and of the remaining six tanks located in monolithic vaults by June 30, 2015. The NON Consent Order, combined with the decision to avoid construction of new RLW storage tanks, results in significantly reduced radioactive liquid storage capacity. Only through the stringent waste minimization techniques will the INEL succeed in performing the waste management mission with reduced storage capacity. For this reason, the generation of all RLW, planned or unplanned, needs to be carefully managed and monitored.

1677 (WSRC-MS-94-0211) Specialized video systems for use in underground storage tanks. Heckendorn, F.M. (Westinghouse Savannah River Co., Aiken, SC (United States)); Robinson, C.W.; Anderson, E.K.; Pardini, A.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950232-1: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States),

5-10 Feb 1995). Order Number DE94019063. Source: OSTI; NTIS; INIS; GPO Dep.

The Robotics Development Groups at the Savannah River Site and the Hanford site have developed remote video and photography systems for deployment in underground radioactive waste storage tanks at Department of Energy (DOE) sites as a part of the Office of Technology Development (OTD) program within DOE. Figure 1 shows the remote video/photography systems in a typical underground storage tank environment. Viewing and documenting the tank interiors and their associated annular spaces is an extremely valuable tool in characterizing their condition and contents and in controlling their remediation. Several specialized video/photography systems and robotic End Effectors have been fabricated that provide remote viewing and lighting. All are remotely deployable into and from the tank, and all viewing functions are remotely operated. Positioning all control components away from the facility prevents the potential for personnel exposure to radiation and contamination. Overview video systems, both monaural and stereo versions, include a camera, zoom lens, camera positioner, vertical deployment system, and positional feedback. Each independent video package can be inserted through a 100 mm (4 in.) diameter opening. A special attribute of these packages is their design to never get larger than the entry hole during operation and to be fully retrievable. The End Effector systems will be deployed on the large robotic Light Duty Utility Arm (LDUA) being developed by other portions of the OTD-DOE programs. The systems implement a multi-functional "over the coax" design that uses a single coaxial cable for all data and control signals over the more than 900 foot cable (or fiber optic) link.

1678 (WSRC-MS-94-0409) Ion exchange pretreatment of alkaline radwaste for cesium removal. Bibler, J.P. (Westinghouse Savannah River Co., Aiken, SC (United States). Savannah River Technology Center). Westinghouse Savannah River Co., Aiken, SC (United States). Aug 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940853-7: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE94017543. Source: OSTI; NTIS; INIS; GPO Dep.

A cation exchange resin has been tested for its ability to remove the Cs ion from simulants of highly alkaline liquid nuclear wastes found at the Savannah River Site, Oak Ridge, and Hanford. The resin is a condensation polymer of the K salt of resorcinol and formaldehyde. It removes milli- and micromolar amounts of Cs⁺ from solutions that contain as high as 11 molar Na⁺. Small column tests indicate that approximately 200 column volumes of SRS simulant and 205 column volumes of OR Tank 25 supernatant simulant can be processed before the resin requires regeneration. For these two wastes, a carousel arrangement of two columns in series and a third in reserve can be used effectively in a process. Hanford 101-AW simulant generates a less sharp breakthrough profile with this resin, though an operation using a maximum of three columns in series with another column off-line for regeneration would be effective if the resin beds are allowed to reach about 90% breakthrough before taking them out of service. Parameters that effect the performance of the resin with a particular feed solution are the concentrations of the two primary ions of interest, Cs⁺ and Na⁺, as well as the concentrations of K⁺ and OH⁻. A further ramification of the hydroxide ion concentration is its role in assisting oxidation of the resin, thereby destroying its

usefulness in cesium removal. Although the performance of the resin is unaffected at doses of $1 \text{ E}+8$ rad ionizing radiation, it shows noticeable degradation after storage for 100 hours in alkaline solutions, generating quinone and ketone groups, as determined from C-13 NMR and by an increase in total organic C content of the contacting solution. Gases detected from the radiolysis of the resin/simulant mixture are CO_2 from the resin, N_2O from nitrate in the simulant, and H_2 possibly from resin and simulant. Oxygen depletion in the mixture results from radiolysis and chemical degradation.

1679 (WSRC-MS-95-0115) Development of a High Level Waste Tank Inspection System. Appel, D.K. (Westinghouse Savannah River Company, SC (United States)); Loibl, M.W.; Meese, D.C. Westinghouse Savannah River Co., Aiken, SC (United States). 21 Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950740-41: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95060106. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Savannah River Technology Center was requested by its sister site, West Valley Nuclear Service (WVNS), to develop a remote inspection system to gather wall thickness readings of their High Level Waste Tanks. WVNS management chose to take a proactive approach to gain current information on two tanks that had been in service since the early 70's. The tanks contain high level waste, are buried underground, and have only two access ports to an annular space between the tank and the secondary concrete vault. A specialized remote system was proposed to provide both a visual surveillance and ultrasonic thickness measurements of the tank walls. A magnetic wheeled crawler was the basis for the remote delivery system integrated with an off-the-shelf Ultrasonic Data Acquisition System. A development program was initiated for Savannah River Technology Center (SRTC) to design, fabricate, and test a remote system based on the Crawler. The system was completed and involved three crawlers to perform the needed tasks, an Ultrasonic Crawler, a Camera Crawler, and a Surface Prep Crawler. The crawlers were computer controlled so that their operation could be done remotely and their position on the wall could be tracked. The Ultrasonic Crawler controls were interfaced with ABB Amdata's I-PC, Ultrasonic Data Acquisition System so that thickness mapping of the wall could be obtained. A second system was requested by Westinghouse Savannah River Company (WSRC), to perform just ultrasonic mapping on their similar Waste Storage Tanks; however, the system needed to be interfaced with the P-scan Ultrasonic Data Acquisition System. Both remote inspection systems were completed 9/94. Qualifications tests were conducted by WVNS prior to implementation on the actual tank and tank development was achieved 10/94. The second inspection system was deployed at WSRC 11/94 with success, and the system is now in continuous service inspecting the remaining high level waste tanks at WSRC.

1680 (WSRC-RP-90-1127) Criticality assessment of TRU burial ground culverts. Winn, W.G. Westinghouse Savannah River Co., Aiken, SC (United States). 26 Sep 1990. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005483. Source: OSTI; NTIS; INIS; GPO Dep.

An effort to assess the criticality risks of ^{239}Pu in TRU Burial Ground Culverts has been underway for several years. The concern arose from discrepancies in two types of

monitors that have been used to assay the ^{239}Pu waste prior to storage in 55-gallon drums that are placed in the culverts. One type is the solid waste monitor (SWM), which is based on gamma-ray measurements; the other is the neutron coincidence monitor, which is based on neutron measurements. The NCC was put into routine service after 1985 and has generally yielded higher ^{239}Pu assays than the SWM. Culverts with pre-1986 waste only had SWM assays of ^{239}Pu ; thus, it was questioned whether their actual ^{239}Pu loadings could be high enough to pose criticality concerns. Studies to characterize the culvert criticality potential have included appraisal of NCC vs SWM, neutron measurements atop the culverts, gamma-ray measurements atop the culverts, and probabilistic risk analyses. Overall, these studies have implied that the culverts are critically safe; however, their results have not been examined collectively. The present report uses the collective information of the preceding studies to arrive at a more complete assessment of the culvert criticality aspects. A conservative k_{eff} is estimated for an individual suspicious culvert and a PRA is evaluated for its "worst" drum. These two pieces of information form the basis of the appraisal, but other evidence is also included as support.

1681 (WSRC-RP-94-146) Year-end report for UST: Cesium extraction testing project DOE/DT&E TTP No. SR1-03-20-01. Bibler, J.P. Westinghouse Savannah River Co., Aiken, SC (United States). 1 Feb 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94009275. Source: OSTI; NTIS; GPO Dep.

This document contains results of a variety of studies on the SRS (Savannah River Site) resorcinol-formaldehyde ion exchange resin with a simulant of the high-level liquid waste found in the Hanford 101-AW tank. Small column studies indicate that flow rates of 2.5 column volumes or less per hour give well-defined breakthrough curves. More rapid flow rates of three to twenty column volumes per hour produce leakage of cesium ion before 50% breakthrough has been reached after processing about 100 column volumes of feed. Upflow elution of the small columns with three concentrations of nitric acid show that about 85% of the cesium, sodium, and potassium ions on the resin can be removed simultaneously with 0.5 M HNO_3 . Radiolysis studies at doses as high as $1\text{E}+09$ rads have shown that the resin is more stable to radiation in water than in the 101-AW simulant. Radiation doses up to $1 \text{ E}+08$ rads did not alter the performance of the resin for cesium removal. Exposure to radiation or storage did not affect the thermal stability of the resin. Hydrogen gas is produced from radiolysis of resin in 101-AW simulant. Other gases that were measured were N_2 , O_2 , CO_2 , N_2O , CO , and CH_4 . Densities and kinetic and dynamic viscosities were determined for the 101-AW simulant at six temperatures ranging between 25°C and 80°C . Preliminary results indicated that the performance of the resin was only slightly diminished with increase in temperature although elution efficiency appeared to be enhanced.

1682 (WSRC-TR-94-0368-Rev.2) In tank processing safety analysis program summary report. Revision 2. Radder, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95010957. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this summary report is to present results from the safety analysis work that was performed in support

of the "Seismic Safety Issue Resolution Program Plan" for the In-Tank Processing (ITP) Facility. Results from this effort include estimates of the consequences that postulated earthquakes might introduce. For beyond evaluation based earthquake (EBE) events, best estimate values (e.g., waste tank volumes) are used rather than bounding values to analyze the consequences of such events. This is consistent with the probabilistic approach outlined in Attachment C of the program plan. Planned follow-on work will also involve best estimates of probabilities for soil liquefaction and differential settlement. These probabilities will be combined in an accident progression event tree (APET) model that is used to provide estimates of risk for beyond EBE seismic events.

1683 (WSRC-TR-95-0108) **Visual Observations of Mixing Quality in a Prototype Canyon Tank.** Hassan, N.M. Westinghouse Savannah River Co., Aiken, SC (United States). 7 Mar 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060105. Source: OSTI; NTIS; INIS; GPO Dep.

A series of mixing tests were performed to identify the range of liquid levels and overall dispersed (organic) concentrations where a constant agitator speed representative of plant operations could eliminate a separate organic layer on the liquid surface. The test runs were made in a transparent, baffled, paddle-agitated, Plexiglas vessel which was fitted with three concentric cooling coils. A visual observation method was used without taking any samples to determine the quality of mixing in the agitated vessel as a function of the total liquid level in the vessel at a given dispersed phase concentration (8 vol %) and various organic phase concentrations at a constant water content. The observations have determined that gross uniform dispersion throughout a canyon tank can be achieved with the current plant impeller speed when the total liquid level is near the vicinity of the second (top) impeller. These observations were recorded in a video tape.

1684 **Organic destruction to enhance the separation of strontium in radioactive wastes.** Schmidt, A.J. (Pacific Northwest Lab., Richland, WA (United States)); Elmore, M.R.; Orth, R.J.; Jones, E.O.; Zacher, A.H.; Hart, T.R.; Neuenschwander, G.G.; Poshusta, J.C. pp. 151-162 of *Metals and materials waste reduction, recovery and remediation*. Liddell, K.C. (ed.); Bautista, R.G. (ed.); Orth, R.J. (ed.). Minerals, Metals and Materials Society, Warrendale, PA (United States) (1994). pp. 242 DOE Contract AC06-76RL01830. (CONF-941016-: Materials week '94, Rosemont, IL (United States), 3-7 Oct 1994).

A low-temperature (300 C to 375 C) hydrothermal organic destruction process is being evaluated to help facilitate the removal of complexed radioactive species from bulk liquid components in Hanford tank waste. The work focuses on hydrothermal processing to destroy organic compounds that contribute to waste safety issues and organic complexants that promote the solubility of radioactive constituents such as ^{90}Sr and ^{241}Am . For the studies discussed here, testing was conducted using a nonradioactive Hanford tank waste simulant. The relative destruction rates of a variety of organic compounds known to be present in Hanford tank waste were evaluated. In addition, the tendency for these organic compounds to complex strontium and the effect of hydrothermal treatment on strontium removal were investigated.

1685 **Actinide separation of high level waste using solvent extractants on magnetic microparticles.** Nunez,

L.; Kaminski, M.; Buchholz, B.A.; Aase, S.B.; Vandegrift, G.F. pp. 358, Paper TECH 12 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Polymer-coated ferromagnetic particles with an absorbed layer of octyl(phenyl)-N,N-diisobutylcarbamoylmethylphosphine oxide (CMPO) diluted by tributyl phosphate (TBP) are being evaluated for application in the separation and the recovery of low concentrations of americium and plutonium from nuclear waste solutions. Due to their chemical nature, these extractants selectively complex americium and plutonium contaminants onto the particles, which can be recovered from the waste solution using a magnet. Chemical characterization of the extractant-absorbed particles from simulated solutions and various nitric acid solutions was performed by gamma and liquid scintillation counting of plutonium and americium. The concentration range is 0.01M HNO_3 to 6M HNO_3 . The actinide partition constant (K_d) at 2M HNO_3 was determined to be between 3000 and 30,000, which is larger than those projected for actinides recovered by additional liquid/liquid extraction. Results from transmission electron microscopy (TEM) indicated a large dependence of K_d on relative magnetite location within the polymer and the polymer surface area. Monitoring the simulated waste solutions by inductively coupled plasma (ICP) analysis demonstrated that magnetite dissolution was 4% after 2 weeks in 5M HNO_3 . Energy disperse spectroscopy (EDS) demonstrated homogeneous metal complexation on the polymer surface with no metal clustering. The radiolytic stability of the particles was studied using ^{60}Co gamma irradiation under various conditions. The results showed that K_d more strongly depends on the nitric acid dissolution rate of the magnetite than the gamma irradiation dose. Results of actinide separation from simulated high level waste representative of that at various DOE sites are discussed.

1686 **Polyethylene glycol-based aqueous biphasic systems: Inexpensive, nontoxic alternatives for Hanford tank remediation.** Rogers, R.D. (Northern Illinois Univ., DeKalb, IL (United States)); Bond, A.H.; Bauer, C.B.; Song, Y.; Zhang, J.; Chomko, R.R. pp. 703, Paper I&EC 17 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

The potential for cleaner, cheaper, safer separations technologies with polyethylene glycol (PEG)-based aqueous biphasic systems stems from the inexpensive, nontoxic, nonflammable nature, and general availability of the PEG and inorganic salts which form them, and the lack of organic diluent. The authors have demonstrated that simulants of the highly alkaline waste stored at Westinghouse Hanford will induce biphasic formation when contacted with aqueous PEG-2000 solutions. They have also demonstrated that the long lived and environmentally mobile radioactive ions $^{99}\text{TcO}_4^-$ and $^{129}\text{I}^-$ can be partitioned from the salt rich to the PEG-rich phase in these aqueous biphasic systems. In addition, they have shown that Group 1 and 2 cation extraction can be accomplished from highly alkaline systems via addition of an appropriate water-soluble extractant. This paper focuses on the factors affecting the distribution ratios and the work on developing a viable separations process.

1687 Solubility relations for aqueous Si, Al, and Cr(III) species in concentrated electrolyte solutions: Development of accurate aqueous thermodynamic models. Felmy, A.R. (Battelle Pacific Northwest Labs., Richland, WA (United States)); Schroeder, C.C.; Rao, L.; Rai, D.; Mason, M.J.; Fulton, R.W. pp. 707, Paper I&EC 32 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Accurate chemical equilibrium data and models are required to understand and predict the complex leaching/dissolution behavior of silica, aluminum, and chromium that are important components of waste tank sludges at Hanford. In this study solubility data were obtained on amorphous silica, gibbsite, and amorphous $\text{Cr}(\text{OH})_3$ in concentrated simple electrolyte solutions (NaNO_3 , NaOH ,...). These data are being used both to better understand the solubility relations for these compounds, which could be present in the sludges, and to develop the necessary Pitzer ion-interaction parameters for important aqueous species of these elements, so that the effects of different electrolytes on solubilization of these elements can be ascertained. The thermodynamic model, which is based upon data from simple electrolyte solutions, was in most cases tested using experimental data on solutions more complex than those used for model parameterization.

1688 Organic analysis of the headspace in Hanford waste tanks. Lucke, R.B. (Pacific Northwest Lab., Richland, WA (United States)); McVeety, B.D.; Clauss, T.W.; Fruchter, J.S.; Goheen, S.C. pp. 712, Paper I&EC 46 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Before radioactive mixed waste in Hanford waste tanks can be isolated and permanently stored, several safety issues need to be addressed. The headspace vapors in Hanford Tank 103-C raise two issues: (1) the potential flammability of the vapor and aerosol, and (2) the potential worker health and safety hazards associated with the toxicity of the constituents. As a result, the authors have implemented organic analysis methods to characterize the headspace vapors in Hanford waste tanks. To address the flammability issue, they have used OSHA versatile sampling (OVS) tubes as the sampling method followed by solvent extraction and GC/MS analysis. For analyzing volatile organics and organic air toxins, they have implemented SUMMA™ canisters as the collection device followed by cryogenic trapping and GC/MS analysis. Strategies for modifying existing NIOSH and EPA methods to make them applicable to vapors in Hanford waste tanks are discussed. Identification and quantification results of volatile and semivolatile organics are presented.

1689 Destruction of organics in Hanford tank wastes using high temperature aqueous systems. Buelow, S.J. (Los Alamos National Lab., NM (United States)); Dell'Orco, P.C.; Ely, J.; Foy, B.R.; Le, F.L.; Wilmanns, E. pp. 712, Paper I&EC 48 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

High temperature hydrothermal processing has been recognized as a possible technology for organic component

destruction in Hanford tank wastes. This technology involves the thermal oxidation of organic matter at temperatures of 350°C to 470°C, using nitrate and nitrite already present in the waste as an oxidant for the organic matter. Reactions are studied at pressures near 1 kbar, which are required to keep 3:1 diluted tank waste simulants as single phase solutions. Organic destruction results are presented for both bench-scale (5-15 g/min) and small pilot-scale (50-100 g/min) reactors. Simple kinetic models are presented for a variety of simulant subsets. Gas production rates and product selectivities are also discussed. Issues concerning the applicability of high temperature hydrothermal processing are identified.

1690 Low temperature hydrothermal destruction of organics in Hanford tank wastes. Schmidt, A.J. (Pacific Northwest Lab., Richland, WA (United States)); Elmore, M.R.; Orth, R.J.; Jones, E.O.; Zacher, A.H.; Hart, T.R.; Neuenschwander, G.G. pp. 715, Paper I&EC 57 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

The objective of this work is to evaluate and develop a low temperature hydrothermal process (HTP) for the destruction of organics that are present in wastes temporarily stored in underground tanks at the Hanford Site. Organic compounds contribute to tank waste safety issues, such as hydrogen generation. Some organic compounds act as complexants, promoting the solubility of radioactive constituents such as ^{90}Sr and ^{241}Am , which is undesirable for waste pretreatment processing. HTP is a thermal-chemical autogenous processing method that is typically operated between 250°C and 375°C and approximately 200 atm. Testing with simulated tank waste containing a variety of organics has been performed. The distribution of strontium, cesium and bulk metals between the supernatant and solid phases as a function of the total organic content of the waste simulant is presented. Test results using simulant are compared with similar tests conducted using actual radioactive waste.

1691 Calcination/dissolution processing of Hanford waste. Colby, S.A. (Westinghouse Hanford Co., Richland, WA (United States)); Delegard, C.H.; Danielson, M.J.; McLaughlin, D.F. pp. 715, Paper I&EC 58 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Thermal treatment by calcination offers several benefits for the treatment of Hanford Site tank waste including the destruction of organics and ferrocyanides, and performs an hydroxide fusion that solubilizes the bulk of the non-radioactive waste from the insoluble transuranic residue. Critical design parameters were tested including: (1) calciner equipment fouling and plugging, (2) hydroxide fusion chemistry, and (3) equipment corrosion. A 2 gpm pilot plant using a simulated 101-SY tank waste produced a free flowing 700°C molten calcine using an average calciner retention time of 20 minutes and >99% organic destruction. Laboratory experiments using actual radioactive tank waste and the simulated waste pilot experiment indicate that 98 wt% of the calcine produced is soluble in water, leaving an insoluble transuranic fraction. All of the Hanford Site tank waste can benefit from calcination processing, contingent upon blending various tank waste types to ensure a minimum of 80

mol% sodium hydroxide/nitrate flux. Finally, corrosion testing indicates that a jacketed nickel liner maintained below 400°C would corrode < 2 ml/y from molten calcine attack.

1692 Tank waste treatment science. LaFemina, J.P. (Pacific Northwest Lab., Richland, WA (United States)); Blanchard, D.L.; Bunker, B.C.; Colton, N.G.; Felmy, A.R.; Franz, J.A.; Liu, J.; Virden, J.W. pp. 719, Paper I&EC 69 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Remediation efforts at the U.S. Department of Energy's Hanford Site require that many technical and scientific principles be combined for effectively managing and disposing the variety of wastes currently stored in underground tanks. Based on these principles, pretreatment technologies are being studied and developed to separate waste components and enable the most suitable treatment methods to be selected for final disposal of these wastes. The Tank Waste Treatment Science Task at Pacific Northwest Laboratory is addressing pretreatment technology development by investigating several aspects related to understanding and processing the tank contents. The experimental work includes evaluating the chemical and physical properties of the alkaline wastes, modeling sludge dissolution, and evaluating and designing ion exchange materials. This paper gives some examples of results of this work and shows how these results fit into the overall Hanford waste remediation activities. This work is part of series of projects being conducted for the Tank Waste Remediation System.

1693 Development of a chemical model for Hanford tank wastes: $\text{Na}^+ \text{--} \text{NO}_3^- \text{--} \text{NO}_2^- \text{--} \text{SO}_4^{2-} \text{--} \text{CO}_3^{2-} \text{--} \text{F}^- \text{--} \text{PO}_4^{3-} \text{--} \text{OH}^- \text{--} \text{Al}(\text{OH})_4^- \text{--} \text{H}_2\text{O}$ system. Felmy, A.R. (Pacific Northwest Lab., Richland, WA (United States)); Rustad, J.R.; Mason, M.J. pp. 726, Paper I&EC 92 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Radioactive wastes stored in underground tanks at the U.S. Department of Energy's Hanford Site are already in contact or potentially can contact solutions that contain high concentrations of the following electrolyte components: NaNO_3 , NaNO_2 , NaOH , NaF , $\text{NaAl}(\text{OH})_4$, Na_2SO_4 , Na_3PO_4 and Na_2CO_3 . Understanding the equilibrium chemistry of these complex chemical systems is one part of developing effective waste pretreatment and sludge dissolution processes. To gain this understanding the authors have derived solubility and osmotic data experimentally for the chemical system $\text{Na}^+ \text{--} \text{NO}_3^- \text{--} \text{NO}_2^- \text{--} \text{SO}_4^{2-} \text{--} \text{CO}_3^{2-} \text{--} \text{F}^- \text{--} \text{PO}_4^{3-} \text{--} \text{OH}^- \text{--} \text{Al}(\text{OH})_4^- \text{--} \text{H}_2\text{O}$ in the temperature range 25°C to 100°C. The interpretation/prediction of these experimental data, as well as other data in the literature, using the Pitzer ion-interaction model are presented. In addition, comparisons with chemical systems more complex than those used for model parameterization are presented to verify the modeling approach. Ongoing experimental studies and model development for other important sludge components such as Al, Si, and Cr are also discussed.

1694 Solubility relations for aqueous Si, Al, and Cr(III) species in concentrated electrolyte solutions: Development of accurate aqueous thermodynamic models. Felmy, A.R. (Battelle Northwest Labs., Richland, WA (United States)). pp. 727, Paper I&EC 94 of 208th ACS national

meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Accurate chemical equilibrium data and models are required to understand and predict the complex leaching/dissolution behavior of silica, aluminum, and chromium that are important components of waste tank sludges at Hanford. In this study solubility data were obtained on amorphous silica, gibbsite, and amorphous $\text{Cr}(\text{OH})_3$ in concentrated simple electrolyte solutions (NaNO_3 , NaOH ,...). These data are being used both to better understand the solubility relations for these compounds, which could be present in the sludges, and to develop the necessary Pitzer ion-interaction parameters for important aqueous species of these elements, so that the effects of different electrolytes on solubilization of these elements can be ascertained. The thermodynamic model, which is based upon data from simple electrolyte solutions, was in most cases tested using experimental data on solutions more complex than those used for model parameterization.

1695 Hanford tank sludges: Investigation of physical and chemical properties using transmission electron microscopy. Liu, J. (Pacific Northwest Lab., Richland, WA (United States)); Virden, J.W.; Bunker, B.C.; Song, L. pp. 727, Paper I&EC 96 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Both the chemical and physical properties of radioactive sludge-type wastes stored in underground tanks on the U.S. Department of Energy's Hanford Site and nonradioactive simulated sludge-type wastes are being investigated to gain a more thorough understanding of the materials. This understanding is intended to provide a foundation for future processing and technology decisions. Transmission electron microscopy (TEM) analyses of sludge-type wastes provide morphological, chemical, and crystalline phase information on a length scale as small as 1 nm. Results from these analyses, which are discussed here, show that a large portion of the insoluble material in the analyzed sludges consists of extremely fine (3 to 100 nm) particles. Washing and alkaline leaching of these sludges dissolve some constituents and cause segregation of residual particles of different sizes and densities, while ultrafine particles appear to be removed as dispersed colloids. Chemical phases vary considerably between distinct sludge types.

1696 Pertechetate partitioning in polyethylene glycol-based aqueous biphasic systems: Applications from nuclear medicine to nuclear waste. Roden, D.M. (Northern Illinois Univ., DeKalb, IL (United States)); Song, Y.; Jezl, M.J.; Bauer, C.B.; Bond, A.H.; Rogers, R.D. pp. 731, Paper I&EC 52 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The authors have discovered that the pertechetate anion, TcO_4^- , readily partitions quantitatively to the polyethylene glycol (PEG)-rich phase in several polyethylene glycol-based aqueous biphasic systems formed when PEG is salted out by phase-forming inorganic salts. Due to the importance of $^{99\text{m}}\text{Tc}$ in nuclear medicine and the environmental mobility of the long-lived $^{99\text{m}}\text{TcO}_4^-$ in nuclear

wastes, the authors have undertaken a complete study of TcO_4^- partitioning in aqueous biphasic systems. The challenge in utilizing these relatively inexpensive, clean, safe aqueous biphasic systems for technetium processing lies in finding suitable stripping conditions. This paper discusses the partitioning behavior of TcO_4^- from K_3PO_4 , K_2CO_3 , $(\text{NH}_4)_2\text{SO}_4$, and NaOH media, explains the factors which affect TcO_4^- uptake, and presents the results in reductive stripping of the loaded PEG-rich phase.

1697 The partitioning behavior of TcO_4^- and I^- in polyethylene glycol-based aqueous biphasic systems prepared from simulated liquid radioactive Hanford tank wastes. Rogers, R.D. (Northern Illinois Univ., DeKalb, IL (United States)); Rein, S.D.; Bauer, C.B.; Zhang, J.; Bond, A.H. pp. 733, Paper I&EC 57 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The potential for cleaner, cheaper, safer separations technologies with polyethylene glycol (PEG)-based aqueous biphasic systems, stems from the inexpensive, nontoxic, nonflammable nature and general availability of PEG and inorganic salts which form them, and the lack of an organic diluent. The challenge lies in finding those separations where traditional oil/water systems either are inapplicable or perform poorly. One such separations problem, currently of high concern and profile, involves the highly alkaline waste storage facilities at Westinghouse Hanford. The authors have demonstrated that simulants of these waste types will induce biphasic formation when contacted with aqueous PEG-2000 solutions. This is most likely a result of the additive action of biphasic-forming salts when present in solution together, and the relative transparency of other matrix ions. The authors have also demonstrated that the long lived and environmentally mobile radioactive ions $^{90}\text{TcO}_4^-$ and $^{129}\text{I}^-$ can be partitioned from the salt-rich to the PEG-rich phase in these aqueous biphasic systems. This paper focuses on the factors affecting the distribution ratios and the work on developing a separations process.

1698 Utilization of dicarbollides and crown ethers for the aqueous biphasic extraction of radionuclides from salt solutions. Navratil, J.D. (Rockwell International, Canoga Park, CA (United States)); Vanura, P.; Jedinakova-Krizova, V. pp. 733-734, Paper I&EC 60 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Investigations are underway in studying the partition of fission product cesium, strontium and europium between sodium carbonate solutions and various polyethylene glycols and slovafoles. Slovafole 909, for example, is a commercial product of Chemical Works, Novaky, Slovakia, and its chemical formula corresponds approximately to p-nonylphenylnonaethylene glycol. Besides the variation of the PEG, the effect of bis-1,2-dicarbollylcobaltate anions and certain crown ethers with PEG on fission product partition was studied.

1699 TRUEX processing of wastes for waste minimization and reagent recycle. Chamberlain, D.B. (Argonne National Lab., IL (United States)); Conner, C.J.; Hutter, J.C.; Wygmans, D.G.; Leonard, R.A.; Vandegrift, G.F. *Transactions of the American Nuclear Society (United*

States); 69: 124-125 (1993). (CONF-931160-: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

The TRUEX (transuranic extraction) process is a solvent extraction process specifically developed to remove, separate, and concentrate actinide elements from nitric acid media. The major application of the TRUEX process is likely to be removal of transuranic (TRU) elements from dissolved sludge waste at the U.S. Department of Energy's (DOE's) Hanford site near Richland, Washington; this sludge was generated during the neutralization of acidic raffinates from the production and purification of plutonium for defense purposes. Other applications of the TRUEX process can be found at other DOE sites: Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee; Rocky Flats Plant (RFP), Boulder, Colorado; Idaho Chemical Processing Plant, Idaho Falls, Idaho; and Los Alamos National Laboratory, Los Alamos, New Mexico. This paper focuses on work performed at Argonne National Laboratory (ANL) to demonstrate the TRUEX process on TRU-containing analytical-residue solutions generated at ANL and the New Brunswick Laboratory. Also discussed are TRUEX flow sheets designed by ANL for wastes specific to RFP and ORNL.

1700 Effect of gamma-ray radiation on the separation efficiencies of coated magnetic microparticles. Buchholz, B.A. (Argonne National Lab., IL (United States)); Nunez, L.; Vandegrift, G.F.; Dunn, M. *Transactions of the American Nuclear Society (United States)*; 69: 126 (1993). (CONF-931160-: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

Volume reduction of high-level waste in the Hanford tanks is both a financial and waste reduction priority. Removal of transuranic (TRU) elements, ^{137}Cs , and ^{90}Sr from supernatant dissolved salts and sludge is being investigated. The removal is to be done with specially coated magnetic microparticles. Magnetic particles are used because they are relatively easy to harvest, and a wide variety of coatings can be obtained. If successful, this separation process, which uses simple, compact, and low-maintenance apparatus (compared to conventional ion exchange and solvent extraction techniques), can significantly reduce the volume of waste requiring vitrification. After TRU, ^{137}Cs , and ^{90}Sr removal, the remaining waste is to be converted to grout, a form of cement. The initial waste focus of the study is the development of different coatings on the magnetic particles that are selective for TRU and ^{137}Cs . The ultimate attractiveness of this separation method depends on the ability to reuse particles 10 to 100 times after the cesium or TRU has been recovered from them. The susceptibility of the outer coatings and the magnetic cores of the particles to radiation and the subsequent effect on separation efficiency will determine how often the particles can be recycled.

1701 Underground tank assessment using Hanford's light-duty utility arm system. Carteret, B.A. (Westinghouse Hanford Co., Richland, WA (United States)). *Transactions of the American Nuclear Society (United States)*; 69: 484-486 (1993). (CONF-931160-: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

In 1989 the Hanford Federal Facility Agreement and Consent Order, or Tri-Party Agreement, was signed initiating a 30-yr program to clean up hazardous chemical and radioactive wastes at the U.S. Department of Energy's (DOE's) Hanford site. A major portion of this program is directed toward the stabilization and remediation of dangerous wastes

accumulated in underground storage tanks. Verification of tank structural integrity and characterization of waste stored in the tanks is a high priority of this program. The light-duty utility arm (LDUA) system is being developed to obtain this vital data. This system will provide the capability to perform tank surveillance and inspection, in situ waste characterization, and small-scale retrieval operations. The DOE's Office of Technology Development (EM-50) is sponsoring this work to support Waste Operations (EM-30) missions, including retrieval and separations technology development, tank characterization and surveillance programs, and tank safety assessment.

1702 Fiber optic apparatus for detecting molecular species by surface enhanced Raman spectroscopy. Angel, S.M.; Sharma, S.K. To Dept. of Energy, Washington, DC (United States). U.S. Patent 4,781,458/A. 1 Nov 1988. Filed date 30 Nov 1987. Int. Cl. G01N 21/65. [10p.] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

Optrode apparatus for detecting constituents of a fluid medium includes an optical fiber having a metal coating on at least a portion of a light transmissive core. The metal is one, such as silver, gold or copper, which enhances emission of Raman signal frequencies by molecules adsorbed on the surface of the coating when monochromatic probe light of a different frequency is scattered by such molecules and the metal coating is sufficiently thin to transmit light between the absorbed molecules and the core of the fiber. Probe light is directed into one end of the fiber and a detector analyzes light emitted from the fiber for Raman frequencies that identify one or more particular molecular species. In one form, the optrode may function as a working electrode of an electrochemical cell while also serving to detect the products of oxidation or reduction reactions which occur at the electrode surface. 6 figs.

LANDFILL STABILIZATION

Refer also to citation(s) 4, 16, 17, 18, 38, 43, 109, 226, 228, 356, 402, 501, 502, 503, 504, 505, 627, 924, 925, 926, 2098, 2304, 2306, 2311, 3047, 3048

1703 (ANL-94/24) Glassy slags for minimum additive waste stabilization: Interim progress report, May 1993-February 1994. Feng, X. (Argonne National Lab., IL (United States). Chemical Technology Div.); Wronkiewicz, D.J.; Bates, J.K.; Brown, N.R.; Buck, E.C.; Dietz, N.L.; Gong, M.; Emery, J.W. Argonne National Lab., IL (United States). May 1994. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94015052. Source: OSTI; NTIS; INIS; GPO Dep.

Glassy slag waste forms are being developed to complement glass waste forms in implementing Minimum Additive Waste Stabilization (MAWS) for supporting DOE's environmental restoration efforts. The glassy slag waste form is composed of various crystalline and metal oxide phases embedded in a silicate glass phase. The MAWS approach was adopted by blending multiple waste streams to achieve up to 100% waste loadings. The crystalline phases, such as spinels, are very durable and contain hazardous and radioactive elements in their lattice structures. These crystalline phases may account for up to 80% of the total volume of slags having over 80% metal loading. The structural bond strength model was used to quantify the correlation between

glassy slag composition and chemical durability so that optimized slag compositions were obtained with limited crucible melting and testing. Slag compositions developed through crucible melts were also successfully generated in a pilot-scale Retech plasma centrifugal furnace at Ukiah, California. Utilization of glassy slag waste forms allows the MAWS approach to be applied to a much wider range of waste streams than glass waste forms. The initial work at ANL has indicated that glassy slags are good final waste forms because of (1) their high chemical durability; (2) their ability to incorporate large amounts of metal oxides; (3) their ability to incorporate waste streams having low contents of flux components; (4) their less stringent requirements on processing parameters, compared to glass waste forms; and (5) their low requirements for purchased additives, which means greater waste volume reduction and treatment cost savings.

1704 (ANL/CMT/CP-81046) Effects of S/V on secondary phase formation on waste glasses. Feng, X. (Argonne National Lab., IL (United States)); Buck, E.C.; Bates, J.K.; Gong, M.; Dietz, N.L.; Pegg, I.L. Argonne National Lab., IL (United States); Catholic Univ. of America, Washington, DC (United States). Vitreous State Lab. [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC07-81NE44139. (CONF-940416-9: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94011508. Source: OSTI; NTIS; INIS; GPO Dep.

Simulated West Valley high-level nuclear waste glass, WV205, was leached with and without buffered media in both deuterated and ordinary water at glass surface area to solution volumes (S/N) of 200-6000 m⁻¹. Examination of the glass surface after testing for 14 days indicated that the S/V-induced pH change plays a dominant role in the development of the altered surface layer and the secondary phases formed. The changes due to SN-induced pH determine the rate of surface layer formation, the element distribution in the surface layer, and possibly, the identities of the secondary phases. Changes due to SN-induced elemental concentration also influence glass reaction rate in terms of the layer thickness and the elemental distribution in the surface layers.

1705 (ANL/CMT/CP-81910) Results of drip tests on sludge-based and actinide-doped glasses. Bates, J.K.; Buck, E.C. Argonne National Lab., IL (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940553-33: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94009687. Source: OSTI; NTIS; INIS; GPO Dep.

The reaction of three diffusers simulated nuclear waste glasses is being evaluated using a test method that slowly drips water onto a glass/metal assembly. The tests have been in progress for up to eight years and are being performed with as-cast and glass aged by reaction with water vapor. Results are presented for the cumulative release of Np, Pu, and Am as a function of time; also reported are the particulate species that have been detected suspended in solution. A significant difference is noted in the suspended species depending on the glass composition, and on whether the glass is aged. With as-cast glass, the radioactivity is associated with the suspended particles, while with the aged glass, the solution has a high initial anion content,

and the transuranic elements appear to be dissolved in solution, since they pass through filters with small pore sizes. Examples are given of possible tests to evaluate the interaction between these test solutions and potential engineered barrier components.

1706 (ANL/CMT/CP-82509) Comparison of glassy slag waste forms produced in laboratory crucibles and in a bench-scale plasma furnace. Feng, X. (Argonne National Lab., IL (United States)); Wronkiewicz, D.J.; Brown, N.R.; Gong, M.; Whitworth, C.; Filius, K.; Battleson, D. Argonne National Lab., IL (United States); MSE, Inc., Butte, MT (United States). [1994]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC22-88ID12735. (CONF-9409178-8: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95001441. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification is currently the best demonstrated available technology for the disposal of high-level radioactive wastes. An innovative vitrification approach known as minimum additive waste stabilization (MAWS) is being developed. Both homogeneous glass and glassy slags have been used in implementing MAWS. Glassy slags (vitro-ceramics) are glass-crystal composites, and they are composed of various metal oxide crystalline phases embedded in an aluminosilicate glass matrix. Glassy slags with compositions developed in crucible melts at Argonne National Laboratory (ANL) were successfully produced in a bench-scale Retech plasma centrifugal furnace (PCF) by MSE, Inc. Detailed examinations of these materials showed that the crucible melts and the PCF produced similar glass and crystalline phases. The two sets of glassy slags exhibited similar chemical durability in terms of normalized releases of their major components. The slags produced in the PCF furnace using metals were usually less oxidized, although this had no effect on the corrosion behavior of the major components of the slags. However, the normalized release rate of cerium was initially lower for the PCF slags. This difference diminished with time as the redox states of the metal oxides in slags began to be controlled by exposure to air in the tests. Thus, the difference in cerium release due to the differences in slag redox state may be transitory. The cerium solubility is a complex function of redox state and solution pH and Eh.

1707 (ANL/CMT/CP-82761) Glassy slag: A complementary waste form to homogeneous glass for the implementation of MAWS in treating DOE low level/mixed wastes. Feng, X. (Argonne National Lab., IL (United States)); Ordaz, G.; Krumrine, P. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-66: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015032. Source: OSTI; NTIS; INIS; GPO Dep.

Glassy slag waste forms are being developed to complement glass waste forms in implementing the Minimum Additive Waste Stabilization (MAWS) Program for supporting DOE's environmental restoration efforts. These glassy slags are composed of various metal oxide crystalline phases embedded in an aluminosilicate glass phase. The slags are appropriate final waste forms for waste streams that contain large amounts of scrap metals and elements with low solubilities in glass, and that have low-flux contents. Homogeneous glass waste forms are appropriate for wastes with

sufficient fluxes and low metal contents. Therefore, utilization of both glass and glassy slag waste forms will make vitrification technology applicable to the treatment of a much larger range of radioactive and mixed wastes. The MAWS approach was applied to glassy slags by blending multiple waste streams to produce the final waste form, minimizing overall waste form volume and reducing costs. The crystalline oxide phases formed in the glassy slags can be specially formulated so that they are very durable and contain hazardous and radioactive elements in their lattice structures. The Structural Bond Strength (SBS) Model was used to predict the chemical durability of the product from the slag composition so that optimized slag compositions could be obtained with a limited number of crucible melts and testing.

1708 (ANL/CMT/PP-78044) Effects of glass surface area-to-solution volume ratio (S/V) on glass dissolution: Part one: Relationship between S/V and leachate pH. Feng, X. (Argonne National Lab., IL (United States). Chemical Technology Div.); Pegg, I.L. Argonne National Lab., IL (United States). Chemical Technology Div.; West Valley Nuclear Services Co., Inc., West Valley, NY (United States). Nov 1992. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC07-81NE44139. Order Number DE95002901. Source: OSTI; NTIS; INIS; GPO Dep.

The observed relationship between S/V and leachate pH is discussed in terms of a simple model of the glass dissolution process. Data from leach tests on several nuclear waste glass compositions at different S/V ratios show that the leachate pH increases with time and then stabilizes at a nearly constant value beyond about 28 days. This stabilized pH increases systematically with the S/V ratio of the test. The model developed here reproduces the essential features of the data and suggests that a single parameter describing the intrinsic rate of alkali diffusion and ion exchange from the glass is sufficient to represent the major glass composition dependence. Interestingly, the results are essentially independent of the rate constant for matrix dissolution. This study suggests that the diffusion-ion exchange process is central in determining the solution pH and its dependence on S/V and the glass reaction, at least under static or low-flow-rate test conditions, is driven by alkali release.

1709 (ANL/EAD/TM-19) Extent of chromium contamination beneath the 60s pits in the Chemical Waste Landfill at Sandia National Laboratories, Albuquerque, New Mexico. Johnson, R. Argonne National Lab., IL (United States). Environmental Assessment Div. Sep 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95000583. Source: OSTI; NTIS; INIS; GPO Dep.

Plume™ and SitePlanner™ were used to analyze the extent of chromium contamination beneath the 60s pits in the Chemical Waste Landfill at Sandia National Laboratories. On the basis of Plume™'s analysis with currently available sampling and the proper locations for that sampling. Finally, a retrospective study was conducted for the site that evaluated the potential for cost savings if the characterization effort had followed an adaptive sampling program approach. Included in this retrospective study was an analysis of the impacts that spatial autocorrelation, soft information, and alternative sampling program goals have on sampling program progress. The conclusion is that by relying on an adaptive sampling program approach at the 60s pits, and leveraging the little soft information that is available for this

location, a significant gain in information could have been realized for the same number of bores.

1710 (BNL-60830) Citrate biodegradation: Mid-year status report, [January 1994-June 1994]. Francis, A.J.; Dodge, C.J.; Chatterjee, S.; Landry, M.F. Brookhaven National Lab., Upton, NY (United States). Jul 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95002243. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Soils Integrated Demonstration (USID) Program was established to demonstrate advanced technologies for the remediation of uranium contaminated soils. This program, managed by the Fernald Environmental Restoration Management Corporation (FERMCO), focuses on the development and demonstration of new soil remediation processes which are faster, safer, and more economical for use at the Fernald site and throughout the DOE complex for cleanup of similar contaminants. Brookhaven National Laboratory (BNL) has developed a process which uses citric acid to treat contaminated soils and wastes with the subsequent recovery of toxic metals and uranium. Citric acid, a naturally occurring organic chelating agent, forms multidentate stable complexes with the transition metals and actinides, and has been effectively used to extract uranium and other metals from solid wastes via the formation of soluble metal citrate complexes. Further studies have also shown that several of the metal citrate complexes are readily biodegraded by microorganisms. During this process, the metals form a precipitate or become associated with the biomass and are recovered at the end of the biodegradation. Although uranyl citrate is recalcitrant to biodegradation, upon exposure to visible light it undergoes photochemical degradation resulting in the formation of an insoluble, stable polymeric form of uranium.

1711 (BNL-60977) In-situ containment and stabilization of buried waste: Annual report FY 1994. Allan, M.L. (Brookhaven National Lab., Upton, NY (United States). Energy Efficiency and Conservation Div.); Kukacka, L.E. Brookhaven National Lab., Upton, NY (United States). Oct 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95003953. Source: OSTI; NTIS; INIS; GPO Dep.

The two landfills of specific interest are the Chemical Waste Landfill (CWL) and the Mixed Waste Landfill (MWL), both located at Sandia National Laboratory. The work is comprised of two subtasks: (1) In-Situ Barriers and (2) In-Situ Stabilization of Contaminated Soils. The main environmental concern at the CWL is a chromium plume resulting from disposal of chromic acid and chromic sulfuric acid into unlined pits. This program has investigated means of in-situ stabilization of chromium contaminated soils and placement of containment barriers around the CWL. The MWL contains a plume of tritiated water. In-situ immobilization of tritiated water with cementitious grouts was not considered to be a method with a high probability of success and was not pursued. This is discussed further in Section 5.0. Containment barriers for the tritium plume were investigated. FY 94 work focused on stabilization of chromium contaminated soil with blast furnace slag modified grouts to bypass the stage of pre-reduction of Cr(6), barriers for tritiated water containment at the MWL, continued study of barriers for the CWL, and jet grouting field trials for CWL barriers at an uncontaminated site at SNL. Cores from the FY 93 permeation grouting field trials were also tested in FY 94.

1712 (BNL-61127) Subsurface barrier verification technologies, Informal report. Heiser, J.H. Brookhaven National Lab., Upton, NY (United States). Jun 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95004950. Source: OSTI; NTIS; INIS; GPO Dep.

One of the more promising remediation options available to the DOE waste management community is subsurface barriers. Some of the uses of subsurface barriers include surrounding and/or containing buried waste, as secondary confinement of underground storage tanks, to direct or contain subsurface contaminant plumes and to restrict remediation methods, such as vacuum extraction, to a limited area. To be most effective the barriers should be continuous and depending on use, have few or no breaches. A breach may be formed through numerous pathways including: discontinuous grout application, from joints between panels and from cracking due to grout curing or wet-dry cycling. The ability to verify barrier integrity is valuable to the DOE, EPA, and commercial sector and will be required to gain full public acceptance of subsurface barriers as either primary or secondary confinement at waste sites. It is recognized that no suitable method exists for the verification of an emplaced barrier's integrity. The large size and deep placement of subsurface barriers makes detection of leaks challenging. This becomes magnified if the permissible leakage from the site is low. Detection of small cracks (fractions of an inch) at depths of 100 feet or more has not been possible using existing surface geophysical techniques. Compounding the problem of locating flaws in a barrier is the fact that no placement technology can guarantee the completeness or integrity of the emplaced barrier. This report summarizes several commonly used or promising technologies that have been or may be applied to in-situ barrier continuity verification.

1713 (BNL-61292) Laboratory evaluation of performance and durability of polymer grouts for subsurface hydraulic/diffusion barriers. Informal report, October 1993-May 1994. Heiser, J.H.; Milian, L.W. Brookhaven National Lab., Upton, NY (United States). May 1994. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95007301. Source: OSTI; NTIS; INIS; GPO Dep.

Contaminated soils, buried waste and leaking underground storage tanks pose a threat to the environment through contaminant transport. One of the options for control of contaminant migration from buried waste sites is the construction of a subsurface barrier. Subsurface barriers increase the performance of waste disposal sites by providing a low permeability layer that can reduce percolation water migration into the waste site, minimize surface transport of contaminants, and reduce migration of volatile species. Also, a barrier can be constructed to envelop the site or plume completely, thereby containing the contaminants and the potential leakage. Portland cement grout curtains have been used for barriers around waste sites. However, large castings of hydraulic cements result invariably in cracking due to shrinkage, thermal stresses induced by the hydration reactions, and wet-dry cycling prevalent at and sites. Therefore, improved, low permeability, high integrity materials are under investigation by the Department of Energy's (DOE) Office of Technology Development, Integrated Demonstrations and Programs. The binders chosen for characterization include: an acrylic, a vinyl ester styrene, bitumen, a polyester styrene, furfuryl alcohol, and sulfur polymer cement. These materials cover broad ranges of chemical and

physical durability, performance, viscosity, and cost. This report details the results of laboratory formulation, testing, and characterization of several innovative polymer grouts. An appendix containing a database of the barrier materials is at the end of this report.

1714 (BNL-61426) Remediation options for a chromium contaminated landfill using cementitious grouts. Allan, M.L. (Brookhaven National Lab., Upton, NY (United States). Dept. of Applied Science); Kukacka, L.E. (Brookhaven National Lab., Upton, NY (United States)). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950216-105: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009544. Source: OSTI; NTIS; GPO Dep.

In-situ remediation of a chemical waste landfill with excessive chromium levels is being investigated as part of the Mixed Waste Landfill Integrated Demonstration. This paper is concerned with the design of advanced cementitious grouts for in-situ stabilization of chromium contaminated soil and in-situ installation of subsurface containment barriers. Grouts have been developed to improve the performance and cost effectiveness of remediation compared with conventional materials. In addition to restoration of chromium contaminated soils, the developed grouts have applications in other environmental operations where superior properties are required.

1715 (CONF-930483-15) Waste minimization opportunities at the U.S. Uranium Mill Tailings Remedial Action (UMTRA) Project, Rifle, Colorado, site. Hartmann, G.L. (Geraghty and Miller, Albuquerque, NM (United States)); Arp, S.; Hempill, H. (Jacobs Engineering Group, Inc., Albuquerque, NM (United States)). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From 9. waste minimization and pollution prevention conference; San Francisco, CA (United States); 13-15 Apr 1993. Order Number DE95007608. Source: OSTI; NTIS; INIS; GPO Dep.

At two uranium mill sites in Rifle, Colorado, the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project is removing uranium mill tailings and contaminated subgrade soils. This remediation activity will result in the production of groundwater contaminated with uranium, heavy metals, ammonia, sulfates, and total dissolved solids (TDS). The initial remediation plan called for a wastewater treatment plant for removal of the uranium, heavy metals, and ammonia, with disposal of the treated water, which still includes the sulfates and TDSS, to the Colorado River. The National Pollutant Discharge Elimination (NPDES) permit issued by the Colorado Department of Health for the two Rifle sites contained more restrictive discharge limits than originally anticipated. During the detailed review of alternate treatment systems to meet these more restrictive limits, the proposed construction procedures were reviewed emphasizing the methods to minimize groundwater production to reduce the size of the water treatment facility, or to eliminate it entirely. It was determined that with changes to the excavation procedures and use of the contaminated groundwater for use in dust suppression at the disposal site, discharge to the river could be eliminated completely.

1716 (CONF-931160-43) Development of the UMTRA Project Groundwater Environmental Impact Statement. Burt, C. (Weston (Roy F.), Inc., Albuquerque,

NM (United States)); Ulland, L.; Metzler, D. (Jacobs Engineering Group, Inc., Albuquerque, NM (United States)). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993. Order Number DE94014402. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the development and preparation of the Programmatic Environmental Impact Statement (PEIS) for the Uranium Mill Tailings Remedial Action (UMTRA) Groundwater Restoration Project. The initiation of the scoping process and preparation of the PEIS began when the Notice of Intent (NOI) to prepare the PEIS was published in the Federal Register on November 18, 1992. However, planning for the PEIS began well before the publication of the NOI, with various aspects of the PEIS, such as the initial formulation of the alternatives and the format of the scoping process, being developed early on. During this preliminary planning phase, it became clear that the preparation of this PEIS posed some significant challenges while at the same time provided for significant opportunities. This paper will briefly summarize the UMTRA Project, discuss the major sections in the PEIS, and describe the challenges and opportunities that developed during the preparation of the PEIS.

1717 (CONF-931160-44) Public participation in UMTRA Project program management. Majors, M.J. (Weston (Roy F.), Inc., Albuquerque, NM (United States)); Ulland, L.M. (Jacobs Engineering Group, Inc., Albuquerque, NM (United States)). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993. Order Number DE94014401. Source: OSTI; NTIS; INIS; GPO Dep.

Innovative techniques for overcoming barriers to public participation on the US Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project have led to improved communications with stakeholders at project sites and improved communications within the project. On the UMTRA Project, it's been shown that an effective public participation program is an essential element to successful project implementation.

1718 (CONF-940225-75) Relationships of radon diffusion coefficient with saturated hydraulic conductivity, fines content and moisture saturation of radon/infiltration barriers for the UMTRA Project. Li, P.Y. (Morrison-Knudsen Co., Inc., Boise, ID (United States)); Chen, P.K. (Jacobs Engineering Group, Inc., Albuquerque, NM (United States)). 24 Jan 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94008608. Source: OSTI; NTIS; GPO Dep.

The release of ²²²Radon to the atmosphere is controlled by the rate of its gas transport through earthen materials. Of the many soil-related parameters, radon diffusion coefficient is the key parameter that characterizes this transport. We compared the radon diffusion coefficients measured at the laboratories for the UMTRA Project with simple empirical correlations developed by others. The empirical correlations predict the radon diffusion coefficient based on the fraction of moisture saturation and porosity. One of the more recent correlations agrees reasonably well with the measurements. In addition, by using a series of correlation curves, we

studied the empirical relationships of the radon diffusion coefficient with the saturated hydraulic conductivity, the fines content, and the moisture saturation in soil. The results reveal that a reliable determination of the long-term moisture and porosity is essential in the design of an adequate radon barrier with respect to the radon diffusion coefficient.

1719 (CONF-940225-78) **Use a Preliminary Requirements Identification Document (PRID) data base to identify facility documents and components and to establish an operating envelope.** Kinney, M.D. (Weston (Roy F.), Inc., Albuquerque, NM (United States)); Woodworth, L.A. USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office. [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94008605. Source: OSTI; NTIS; GPO Dep.

A challenge that arises consistently throughout the US Department of Energy (DOE) arena is difficulty in identifying the regulatory requirements for the unique operations of a given facility in a cost-effective and consistent manner. This challenge is further compounded by the hundreds of regulatory documents/statutes that must be assessed, as mandated by specific DOE Orders or facility components. As the missions of selected DOE facilities evolve or change, it is becoming of paramount importance to readily identify each affected facility's current "operating envelope" (i.e., what regulatory requirements documents are applicable, based upon facility operations and/or programs), to aide in cost projection and scheduling efforts for mission changes. The ability to determine a facility's current operating envelope will also greatly aid in environmental restoration and/or decommissioning efforts because regulatory concerns/issues and facility-specific processes will have already been identified. To date, each DOE facility, or group of facilities, has attempted to establish an operating envelope without using a consistent strategy or methodology. This, in turn, has led to facility reviews that vary widely. For instance, not all DOE Orders are being addressed; code requirements are not being identified for facility processing systems required to support operations, and there is no consistent format or structure for a final report. To address this need, the Uranium Mill Tailings Remedial Action (UMTRA) Project personnel have developed an electronic Preliminary Requirements Identification Document (PRID) data base.

1720 (CONF-940225-114) **Influence of attrition scrubbing, ultrasonic treatment, and oxidant additions on uranium removal from contaminated soils.** Timpson, M.E.; Elless, M.P.; Francis, C.W. Oak Ridge National Lab., TN (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94013281. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Uranium in Soils Integrated Demonstration Project being conducted by the US Department of Energy, bench-scale investigations of selective leaching of uranium from soils at the Fernald Environmental Management Project site in Ohio were conducted at Oak Ridge National Laboratory. Two soils (storage pad soil and incinerator soil), representing the major contaminant sources at the site, were extracted using carbonate- and citric acid-based lixiviants. Physical and chemical processes were used in

combination with the two extractants to increase the rate of uranium release from these soils. Attrition scrubbing and ultrasonic dispersion were the two physical processes utilized. Potassium permanganate was used as an oxidizing agent to transform tetravalent uranium to the hexavalent state. Hexavalent uranium is easily complexed in solution by the carbonate radical. Attrition scrubbing increased the rate of uranium release from both soils when compared with rotary shaking. At equivalent extraction times and solids loadings, however, attrition scrubbing proved effective only on the incinerator soil. Ultrasonic treatments on the incinerator soil removed 71% of the uranium contamination in a single extraction. Multiple extractions of the same sample removed up to 90% of the uranium. Additions of potassium permanganate to the carbonate extractant resulted in significant changes in the extractability of uranium from the incinerator soil but had no effect on the storage pad soil.

1721 (CONF-940225-120) **Physicochemical and mineralogical characterization of uranium-contaminated soils from the Fernald Integrated Demonstration Site.** Elless, M.P.; Lee, S.Y.; Timpson, M.E. Oak Ridge National Lab., TN (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94017703. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated approach that utilizes various characterization technologies has been developed for the Uranium Soil Integrated Demonstration program. The Fernald Environmental Restoration Management Corporation site near Cincinnati, Ohio, was selected as the host facility for this demonstration. Characterization of background, untreated contaminated, and treated contaminated soils was performed to assess the contamination and the effect of treatment efforts to remove uranium from these soils. Carbonate minerals were present in the contaminated soils (added for erosion control) but were absent in the nearby background soils. Because of the importance of the carbonate anion to uranium solubility, the occurrence of carbonate minerals in these soils will be an important factor in the development of a successful remediation technology. Uranium partitioning data among several particle-size fractions indicate that conventional soil washing will be ineffective for remediation of these soils and that chemical extraction will be necessary to lower the uranium concentration to the target level (52 mg/kg). Carbonate-based (sodium carbonate/bicarbonate) and acid-based (sulfuric and citric acids) lixiviants were employed for the selective removal of uranium from these soils. Characterization results have identified uranium phosphate minerals as the predominant uranium mineral form in both the untreated and treated soils. The low solubility associated with phosphate minerals is primarily responsible for their occurrence in the posttreated soils. Artificial weathering of the treated soils caused by the treatments, particularly acid-based lixiviants, was documented by their detrimental effects on several physicochemical characteristics of these soils (e.g., soil pH, particle-size distribution, and mineralogy).

1722 (CONF-940225-121) **Uranium removal from soils: An overview from the Uranium in Soils Integrated Demonstration program.** Francis, C.W. (Oak Ridge National Lab., TN (United States)); Brainard, J.R.; York, D.A.; Chaiko, D.J.; Matthern, G. Oak Ridge National Lab., TN (United States). [1994]. 13p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94017705. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated approach to remove uranium from uranium-contaminated soils is being conducted by four of the US Department of Energy national laboratories. In this approach, managed through the Uranium in Soils Integrated Demonstration program at the Fernald Environmental Management Project, Fernald, Ohio, these laboratories are developing processes that selectively remove uranium from soil without seriously degrading the soil's physicochemical characteristics or generating waste that is difficult to manage or dispose of. These processes include traditional uranium extractions that use carbonate as well as some nontraditional extraction techniques that use citric acid and complex organic chelating agents such as naturally occurring microbial siderophores. A bench-scale engineering design for heap leaching; a process that uses carbonate leaching media shows that >90% of the uranium can be removed from the Fernald soils. Other work involves amending soils with cultures of sulfur and ferrous oxidizing microbes or cultures of fungi whose role is to generate mycorrhiza that excrete strong complexers for uranium. Aqueous biphasic extraction, a physical separation technology, is also being evaluated because of its ability to segregate fine particulate, a fundamental requirement for soils containing high levels of silt and clay. Interactions among participating scientists have produced some significant progress not only in evaluating the feasibility of uranium removal but also in understanding some important technical aspects of the task.

1723 (CONF-940815-5) Field demonstrations of passive detectors for screening of alpha contaminated soils. Meyer, K.E.; Gammage, R.B.; Dudney, C.S. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94011467. Source: OSTI; NTIS; INIS; GPO Dep.

There are numerous sites around the country, DOE and otherwise, that are faced with the daunting task of remediating radiologically contaminated soils and groundwaters. Some of these sites, such as the Nevada Test Site and the Rocky Flats Plant, have contaminants that have been dispersed over wide areas. The costs of the characterization phase alone for such remediation programs can be prohibitive. Therefore there are pressing needs for testing and evaluation of new technologies for screening for radiological contaminants that may offer significant advantages in capital costs, ease of use, sensitivity, ruggedness, and/or reliability. This work reports on laboratory and field tests of two types of passive alpha detectors, electret ionization chambers (EIC's) and alpha track detectors (ATD's), that have been commercially developed for indoor radon measurements. Previous work documented calibration and measurement protocols developed for these detectors for indoor surface contamination measurements.

1724 (CONF-940983-5) Passive field monitoring of plutonium and americium in soil. Gammage, R.B. (Oak Ridge National Lab., TN (United States). Health Sciences Research Div.); Meyer, K.E.; Dudney, C.S. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC05-84OR21400. From 2. international symposium and exhibition on environmental contamination in Central and Eastern Europe; Budapest (Hungary); 20-23 Sep 1994. Order Number DE95006739. Source: OSTI; NTIS; INIS; GPO Dep.

The authors' progress is described in applying passive alpha track detectors (ATDS) and electret ion chambers (EICs) to in-situ field monitoring of soils contaminated with particulate plutonium and americium at a desert site. By varying the exposure times, from a few minutes to about one day, they quantitatively measured alpha activity varying between ~ 100 pCi/g and ~ 100 nCi/g. Suggested applications are definition of the boundaries of contamination zones and verification that post-remediated soils are below release limits.

1725 (CONF-941124-8) The PRISM concept. Circeo, L.J. Jr. (Georgia Inst. of Tech., Atlanta, GA (United States). Construction Research Center); Jacobs, G.K.; Camacho, S.L.; Tixier, J.S. Oak Ridge National Lab., TN (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies; Richland, WA (United States); 7-11 Nov 1994. Order Number DE94018133. Source: OSTI; NTIS; INIS; GPO Dep.

Contaminated soils and buried wastes represent one of the most widespread and costly remediation problems in the United States and other developed countries around the world. This concept of in situ remediation using a plasma arc torch should be directly applicable to many of the contaminated soil remediation needs described by the DOE, EPA, and DoD. Plasma Remediation of In Situ Materials (PRISM) could provide a highly efficient, cost-effective, reliable and controllable technique to selectively melt and vitrify any contaminated/buried volume of soils, materials, or objects at any depth underground. If necessary, it could pinpoint underground objects such as buried drums for selective remediation. Plasma arc technology was developed over 30 years ago by NASA for the US space program to simulate reentry temperatures on heat shields. Only recently has this technology begun to emerge as a commercial tool in several industries such as steelmaking, metallurgy, precious metal recovery, and waste disposal. Conceptually, a plasma torch could be used on the ground surface or lowered to the bottom of a small diameter, cased borehole. By raising and operating the torch at progressively higher levels a column of contaminated material would be vitrified and converted into an environmentally safe, glassy residue, highly resistant to leaching. With proper borehole spacing the vitrified columns could be coalesced together to form a contiguous, homogeneous mass of vitrified material which is environmentally safe and highly resistant to leaching.

1726 (CONF-950268-1) The U.S. regulatory framework for long-term management of uranium mill tailings. Smythe, C. (Dept. of Energy, Albuquerque, NM (United States)); Bierley, D.; Bradshaw, M. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From International conference on radiation protection and radioactive waste management in the mining and minerals industry; No City Given (South Africa); 20 Feb 1995. Order Number DE95007618. Source: OSTI; NTIS; INIS; GPO Dep.

The US established the regulatory structure for the management, disposal, and long-term care of uranium mill tailings in 1978 with the passage of the Uranium Mill Tailings Radiation Control Act (UMTRCA) (Pub. L. 95-604). This legislation has governed the cleanup and disposal of uranium tailings at both inactive and active sites. The passage of the UMTRCA established a federal regulatory program for the cleanup and disposal of uranium mill tailings in the US. This program involves the DOE, the NRC, the EPA, various states and tribal governments, private licensees, and the general public. The DOE has completed surface remediation at 14 sites, with the remaining sites either under construction or in planning. The DOE's UMTRA Project has been very successful in dealing with public and agency demands, particularly regarding disposal site selection and transportation issues. The active sites are also being cleaned up, but at a slower pace than the inactive sites, with the first site tentatively scheduled for completion in 1996.

1727 (CONF-950268-2) Engineering solutions to the long-term stabilization and isolation of uranium mill tailings in the United States. Sanders, D.R. (Morrison Knudsen Environmental Services, San Francisco, CA (United States). UMTRA Project); Lommler, J.C. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From International conference on radiation protection and radioactive waste management in the mining and minerals industry; No City Given (South Africa); 20 Feb 1995. Order Number DE95007614. Source: OSTI; NTIS; INIS; GPO Dep.

Engineering solutions to the safe and environmentally protective disposal and isolation of uranium mill tailings in the US include many factors. Cover design, materials selection, civil engineering, erosive forces, and cost effectiveness are only a few of those factors described in this paper. The systems approach to the engineering solutions employed in the US is described, with emphasis on the standards prescribed for the Uranium Mill Tailings Remedial Action Project. Stabilization and isolation of the tailings from humans and the environment are the primary goals of the US uranium mill tailings control standards. The performance of cover designs with respect to water infiltration, radon exhalation, geotechnical stability, erosion protection, human and animal intrusion prevention, and longevity are addressed. The need for and frequency of surveillance efforts to ensure continued disposal system performance are also assessed.

1728 (CONF-950268-3) Contaminant distributions at typical U.S. uranium milling facilities and their effect on remedial action decisions. Hamp, S. (USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office); Jackson, T.J.; Dotson, P.W. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From International conference on radiation protection and radioactive waste management in the mining and minerals industry; No City Given (South Africa); 20 Feb 1995. Order Number DE95007606. Source: OSTI; NTIS; INIS; GPO Dep.

Past operations at uranium processing sites throughout the US have resulted in local contamination of soils and ground water by radionuclides, toxic metals, or both. Understanding the origin of contamination and how the constituents are distributed is a basic element for planning

remedial action decisions. This report describes the radiological and nonradiological species found in ground water at a typical US uranium milling facility. The report will provide the audience with an understanding of the vast spectrum of contaminants that must be controlled in planning solutions to the long-term management of these waste materials.

1729 (DOE/AL/62350-3F) Burrell, Pennsylvania, vicinity property Long-Term Surveillance Plan. Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1993. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008758. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to establish elements of the US Department of Energy (DOE) Long-Term Surveillance Plan (LTSP) for the Burrell, Pennsylvania, vicinity property. The US Nuclear Regulatory Commission (NRC) will use this plan to support the issuance of a license for the long-term surveillance and maintenance of the Burrell vicinity property. The DOE and the NRC previously reached agreement regarding the issuance of a license for the Burrell vicinity property. This is a departure from the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, which requires the licensing only of disposal sites, not vicinity properties. However, given the unusually large volume of wastes and the distance from the Canonsburg disposal cell of the Burrell vicinity property, it was agreed that a license for a designed disposal cell with surveillance requirements constituted a reasonable and prudent approach in keeping with the spirit of UMTRCA. The Burrell vicinity property covers approximately 29 hectares (72 acres). Disposal of the 10,500 tonnes (11,600 tons) of residual radioactive material (RRM) removed from the Canonsburg Uranium Mill Tailings Remedial Action (UMTRA) Project site took place within an approximately 0.6-hectare (1.6-acre) section in the western portion and an approximately 0.6-hectare (1.6-acre) section in the eastern portion of the Burrell vicinity property. The RRM was brought in as fill for under the ConRail railroad tracks. The excess RRM was placed in a storage location adjacent to the Conemaugh River at Burrell, which was later added to the disposal area. The disposal area contains a total of 78,000 tonnes (86,000 tons) of RRM.

1730 (DOE/AL/62350-5-Rev.1) Uranium Mill Tailings Remedial Action Project Safety Advancement Field Effort (SAFE) Program. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003917. Source: OSTI; NTIS; INIS; GPO Dep.

In 1992, the Uranium Mill Tailings Remedial Action (UMTRA) Project experienced several health and safety related incidents at active remediation project sites. As a result, the U.S. Department of Energy (DOE) directed the Technical Assistance Contractor (TAC) to establish a program increasing the DOE's overall presence at operational remediation sites to identify and minimize risks in operations to the fullest extent possible (Attachments A and B). In response, the TAC, in cooperation with the DOE and the Remedial Action Contractor (RAC), developed the Safety Advancement Field Effort (SAFE) Program.

1731 (DOE/AL/62350-7D-Rev.1) Comments and responses on the Remedial Action Plan and site design for stabilization of the Inactive Uranium Mill Tailings

Site, Grand Junction, Colorado. Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008760. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains information concerning public comments and responses on the remedial action plan and site design for stabilization of the inactive uranium mill tailings site in Grand Junction, Colorado.

1732 (DOE/AL/62350-8F) Geomorphic stability field reconnaissance site visit, Canonsburg, Pennsylvania, December 1992. Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008761. Source: OSTI; NTIS; INIS; GPO Dep.

To license the Canonsburg site, the US Nuclear Regulatory Commission (NRC) has required that geomorphic stability be demonstrated for the stream banks and slopes around the perimeter of the site for 200 years. Based on a study of the stream channel and slopes, it has been determined that due to recent human intervention, the required geomorphic stability cannot now be achieved without installation of erosion protection works and continued monitoring of the site. The Pittsburgh District Corps of Engineers has plans to channelize Chartiers Creek and install erosion protection rock within the next 5 or 6 years, if local government agencies raise the necessary matching funds. Much of the stream bank and slope adjacent to the "fenced in" western area of the site is anticipated to remain geomorphically stable for more than 20 years, but less than 200 years without human intervention. Therefore in much of this area, the Corps of Engineers will have adequate time to perform its work without jeopardizing the integrity of the controlled area. In contrast, two approximately 200-foot (ft) (60-meter [m]) long portions of the stream channel located north-northwest of the encapsulation area are subject to active stream erosion that threatens the integrity of the controlled area. These areas should be fixed by installation of erosion protection rock within the next 2 years.

1733 (DOE/AL/62350-12F) Radiological surveillance of Remedial Action activities at the processing site, Falls City, Texas. Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008757. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project's Technical Assistance Contractor (TAC) performed a radiological surveillance of the Remedial Action Contractor (RAC), MK-Ferguson and CWM Federal Environmental Services, Inc., at the processing site in Falls City, Texas. This surveillance was conducted March 22-26, 1993. No findings were identified during the surveillance. Three site-specific observations and three programmatic observations are presented in this report. The overall conclusion from the surveillance is that the radiological aspects of the Falls City, Texas, remedial action program are performed adequately. However, some of the observations identify that there is potential for improving certain aspects of the occupational radiological air sampling, ensuring analytical data quality, and in communicating with the DOE and TAC on the ore sampling methods. The TAC has also received and is

currently reviewing the RAC's responses regarding the observations identified during the radiological surveillance performed October 29-30, 1992.

1734 (DOE/AL/62350-15F) Radiological surveillance of Remedial Action activities at the processing site, Ambrosia Lake, New Mexico, April 12-16, 1993. Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008756. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project's Technical Assistance Contractor (TAC) performed a radiological surveillance of the Remedial Action Contractor (RAC), MK-Ferguson and CWM Federal Environmental Services, Inc., at the processing site in Ambrosia Lake, New Mexico. The requirements and attributes examined during the audit were developed from reviewing working-level procedures developed by the RAC. Objective evidence, comments, and observations were verified based on investigating procedures, documentation, records located at the site, personal interviews, and tours of the site. No findings were identified during this audit. Ten site-specific observations, three good practice observations, and five programmatic observations are presented in this report. The overall conclusion from the surveillance is that the radiological aspects of the Ambrosia Lake, New Mexico, remedial action program are performed adequately. The results of the good practice observations indicate that the site health physics (HP) staff is taking the initiative to address and resolve potential issues, and implement suggestions useful to the UMTRA Project. However, potential exists for improving designated storage areas for general items, and the RAC Project Office should consider resolving site-specific and procedural inconsistencies.

1735 (DOE/AL/62350-17F) Adsorption isotherm special study. Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1993. 169p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008763. Source: OSTI; NTIS; INIS; GPO Dep.

The study was designed to identify methods to determine adsorption applicable to Uranium Mill Tailings Remedial Action (UMTRA) Project sites, and to determine how changes in aquifer conditions affect metal adsorption, resulting retardation factors, and estimated contaminant migration rates. EPA and ASTM procedures were used to estimate sediment sorption of U, As, and Mo under varying groundwater geochemical conditions. Aquifer matrix materials from three distinct locations at the DOE UMTRA Project site in Rifle, CO, were used as the adsorbents under different pH conditions; these conditions stimulated geochemical environments under the tailings, near the tailings, and down-gradient from the tailings. Grain size, total surface area, bulk and clay mineralogy, and petrography of the sediments were characterized. U and Mo yielded linear isotherms, while As had nonlinear ones. U and Mo were adsorbed strongly on sediments acidified to levels similar to tailings leachate. Changes in pH had much less effect on As adsorption. Mo was adsorbed very little at pH 7-7.3, U was weakly sorbed, and As was moderately sorbed. Velocities were estimated for metal transport at different pHs. Results show that the aquifer materials must be characterized to estimate metal transport velocities in aquifers and to develop groundwater restoration strategies for the UMTRA project.

1736 (DOE/AL/62350-18F) **Quality assurance project plan for the UMTRA technical assistance contractor hydrochemistry facility. Final report.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008755. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) hydrochemistry facility is used to perform a limited but important set of services for the UMTRA Project. Routine services include support of field-based hydrological and geochemical operations and water sampling activities. Less commonly, the hydrology and geochemistry staff undertake special studies and site characterization studies at this facility. It is also used to train hydrologists, geochemists, and groundwater sampling crews. A review of this Quality Assurance Project Plan (QAPP) shall be accomplished once each calendar year. This review will be targeted to be accomplished not sooner than 6 months and not later than 18 months after the last review.

1737 (DOE/AL/62350-19F-Rev.3) **Long-term surveillance plan for the Collins Ranch disposal site, Lakeview, Oregon.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018483. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project Collins Ranch disposal site, Lakeview, Oregon, describes the surveillance activities for the disposal cell. The U.S. Department of Energy (DOE) will carry out these activities to ensure that the disposal cell continues to function as designed. This final LTSP was prepared as a requirement for acceptance under the U.S. Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials. This LTSP documents whether the land and interests are owned by the United States and details how long-term care of the disposal site will be carried out. It is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program (DOE, 1992a).

1738 (DOE/AL/62350-23F) **Special study for the statistical evaluation of groundwater data trends. Final report.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1993. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008754. Source: OSTI; NTIS; INIS; GPO Dep.

Analysis of trends over time in the concentrations of chemicals in groundwater at Uranium Mill Tailings Remedial Action (UMTRA) Project sites can provide valuable information for monitoring the performance of disposal cells and the effectiveness of groundwater restoration activities. Random variation in data may obscure real trends or may produce the illusion of a trend where none exists, so statistical methods are needed to reliably detect and estimate trends. Trend analysis includes both trend detection and estimation. Trend detection uses statistical hypothesis testing and provides a yes or no answer regarding the existence of a trend. Hypothesis tests try to reach a balance between false negative and false positive conclusions. To quantify the magnitude of a trend, estimation is required. This report presents the statistical concepts that are necessary for understanding trend analysis. The types of patterns most likely to occur in UMTRA data sets are emphasized. Two general approaches to

analyzing data for trends are proposed and recommendations are given to assist UMTRA Project staff in selecting an appropriate method for their site data. Trend analysis is much more difficult when data contain values less than the reported laboratory detection limit. The complications that arise are explained. This report also discusses the impact of data collection procedures on statistical trend methods and offers recommendations to improve the efficiency of the methods and reduce sampling costs. Guidance for determining how many sampling rounds might be needed by statistical methods to detect trends of various magnitudes is presented. This information could be useful in planning site monitoring activities.

1739 (DOE/AL/62350-24F-Attach.2) **Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site, Maybell, Colorado: Remedial action selection report: Attachment 2, Geology report, Final.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018529. Source: OSTI; NTIS; INIS; GPO Dep.

The Maybell uranium mill tailings site is 25 miles (mi) (40 kilometers [km]) west of the town of Craig, Colorado, in Moffat County, in the northwestern part of the state. The unincorporated town of Maybell is 5 road mi (8 km) southwest of the site. The designated site covers approximately 110 acres (ac) (45 hectares [ha]) and consists of a concave-shaped tailings pile and rubble from the demolition of the mill buildings buried in the former mill area. Contaminated materials at the Maybell processing site include the tailings pile, which has an average depth of 20 feet (ft) (6 meters [m]) and contains 2.8 million cubic yards (yd³) (2.1 million cubic meters [m³]) of tailings. The former mill processing area is on the north side of the site and contains 20,000 yd³ (15,000 m³) of contaminated demolition debris. Off-pile contamination is present and includes areas adjacent to the tailings pile, as well as contamination dispersed by wind and surface water flow. The volume of off-pile contamination to be placed in the disposal cell is 550,000 yd³ (420,000 m³). The total volume of contaminated materials to be disposed of as part of the remedial action is estimated to be 3.37 million yd³ (2.58 million m³). Information presented in this Final Remedial Action Plan (RAP) and referenced in supporting documents represents the current disposal cell design features and ground water compliance strategy proposed by the US Department of Energy (DOE) for the Maybell, Colorado, tailings site. Both the disposal cell design and the ground water compliance strategy have changed from those proposed prior to the preliminary final RAP document as a result of prudent site-specific technical evaluations.

1740 (DOE/AL/62350-24F-Attach.3-4) **Remedial action plan and site design for stabilization of the inactive Uranium Mill Tailing site Maybell, Colorado: Attachment 3, ground water hydrology report, Attachment 4, water resources protection strategy. Final report.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018530. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Environmental Protection Agency (EPA) has established health and environmental regulations to correct and prevent ground water contamination resulting from

former uranium processing activities at inactive uranium processing sites (40 CFR Part 192 (1993)) (52 FR 36000 (1978)). According to the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 USC § 7901 et seq.), the U.S. Department of Energy (DOE) is responsible for assessing the inactive uranium processing sites. The DOE has decided that each assessment will include information on hydrogeologic site characterization. The water resources protection strategy that describes the proposed action compliance with the EPA ground water protection standards is presented in Attachment 4, Water Resources Protection Strategy. Site characterization activities discussed in this section include the following: (1) Definition of the hydrogeologic characteristics of the environment, including hydrostratigraphy, aquifer parameters, areas of aquifer recharge and discharge, potentiometric surfaces, and ground water velocities. (2) Definition of background ground water quality and comparison with proposed EPA ground water protection standards. (3) Evaluation of the physical and chemical characteristics of the contaminant source and/or residual radioactive materials. (4) Definition of existing ground water contamination by comparison with the EPA ground water protection standards. (5) Description of the geochemical processes that affect the migration of the source contaminants at the processing site. (6) Description of water resource use, including availability, current and future use and value, and alternate water supplies.

1741 (DOE/AL-62350-24F-Attach.3-App.A) Remedial action plan and site design for stabilization of the Inactive Uranium Mill Tailings Site, Maybell, Colorado: Final report, Appendixes to attachment 3. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 317p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018531. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains supporting appendices to attachment 3 for the remedial action and site stabilization plan for Maybell, Colorado UMTRA site. Appendix A includes the Hydrological Services Calculations and Appendix B contains Ground Water Quality by Location data.

1742 (DOE/AL/62350-25F) Radiological audit of remedial action activities at the processing sites Mexican Hat, Utah and Monument Valley, Arizona. Audit date: May 3-7, 1993, Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008753. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project's Technical Assistance Contractor (TAC) performed a radiological audit of the Remedial Action Contractor (RAC), MK-Ferguson and CWM Federal Environmental Services, Inc., at the processing sites in Mexican Hat, Utah, and Monument Valley, Arizona. This audit was conducted May 3-7, 1993, by Bill James and Gerry Simiele of the TAC. Three site-specific findings and four observations were identified during the audit and are presented in this report. The overall conclusion from the audit is that the majority of the radiological aspects of the Mexican Hat, Utah, and Monument Valley, Arizona, remedial action programs are performed adequately. However, the findings identify that there is some inconsistency in following procedures and meeting requirements for contamination control, and a lack of communication between the RAC and the DOE on variances from the published remedial action plan (RAP).

1743 (DOE/AL/62350-26) Implementation plan for the programmatic environmental impact statement for the Department of Energy UMTRA Ground Water Project. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001265. Source: OSTI; NTIS; INIS; GPO Dep.

Under the Uranium Mill Tailings Remedial Action (UMTRA) Project, the U.S. Department of Energy (DOE) is cleaning up contamination to protect human health and the environment at 24 inactive uranium processing sites located in 10 states. Five of the sites are either on or near Native American lands. The UMTRA Project is divided into two projects: Surface and Ground Water. On November 18, 1992, the DOE issued a notice of intent (57 FR 54374, 1992) to prepare a programmatic environmental impact statement (PEIS) for the UMTRA Ground Water Project. The PEIS will result in a record of decision that will determine how the UMTRA Ground Water Project will address ground water contamination resulting from milling operations at the UMTRA Project processing sites. DOE regulations (10 CFR § 1021.312) require that an implementation plan be prepared to provide guidance for preparing a PEIS and to record the results of the scoping process. This implementation plan describes and records the results of the PEIS scoping process; summarizes comments received and their disposition; describes the purpose of and need for agency action, the proposed action, and alternatives; lists alternatives considered and eliminated from review; identifies cooperating agencies, their roles, and responsibilities; provides a draft PEIS outline, which includes the planned PEIS scope and content (Attachment A); and provides a schedule for the PEIS process. This plan will be placed in the UMTRA Project libraries listed in Attachment B. The PEIS will identify and evaluate the potential impacts associated with alternatives for conducting the UMTRA Ground Water Project. The PEIS will not assess site-specific impacts; site-specific impacts must be analyzed in separate National Environmental Policy Act (NEPA) documents that will tier off the PEIS. This tiering process will streamline the preparation of site-specific NEPA documents.

1744 (DOE/AL/62350-28) UMTRA water sampling technical (peer) review: Responses to observations, comments, and recommendations submitted by Don Messinger (Roy F. Weston, Inc.). Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008752. Source: OSTI; NTIS; INIS; GPO Dep.

An independent technical review (peer review) was conducted during the period of September 15-17, 1992. The review was conducted by C. Warren Ankerberg (Geraghty and Miller, Inc., Tampa, Florida) and Don Messinger (Roy F. Weston, Inc., West Chester, Pennsylvania). The review was held at Jacobs Engineering in Albuquerque, New Mexico, and at the Shiprock, New Mexico, site. The peer review included a review of written documentation [water sampling standard operating procedures (SOP)], an inspection of technical reports and other deliverables, a review of staff qualifications and training, and a field visit to evaluate the compliance of field procedures with SOPs. Upon completion of the peer review, each reviewer independently prepared a report of findings from the review. The reports listed findings and recommended actions. This document responds to the observations, comments, and recommendations submitted by Don Messinger following his review. The format of this

document is to present the findings and recommendations verbatim from Mr. Messinger's report, followed by responses from the UMTRA Project staff. Included in the responses from the UMTRA Project staff are recommended changes in SOPs and strategies for implementing the charges.

1745 (DOE/AL/62350-29) UMTRA water sampling technical (peer) review. Responses to observations, comments, and recommendations submitted by C. Warren Ankerberg (Geraghty & Miller, Inc.). Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009831. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the Office of Independent Technical Review for the U.S. Department of Energy (DOE), Uranium Mill Tailings Remedial Action (UMTRA) Project, an independent technical review (peer review) was conducted during the period of September 15-17, 1992. The review was conducted by C. Warren Ankerberg (Geraghty & Miller, Inc., Tampa, Florida) and Don Messinger (Roy F. Weston, Inc., West Chester, Pennsylvania). The peer review included a review of written documentation [water sampling standard operating procedures (SOP)], an inspection of technical reports and other deliverables, a review of staff qualifications and training, and a field visit to evaluate the compliance of field procedures with SOPs. The approach of the peer reviewers was to verify that the program meets the following criteria: Reported results are traceable to and consistent with recorded data. The basic assumptions and acceptance criteria are valid. Data are traceable to their origin and to reported analytical results. The procedures employed are consistent both internally and externally with written SOPs and regulatory guidelines. Inferences and conclusions are soundly based. The procedures and/or reports generated present work that satisfies the local, state and/or Federal regulatory requirements as applicable. The approach is consistent with industry standards and/or state-of-the-art technology, as practical. The data generated by activities are legally defensible and technically sound. UMTRA staff are adequately trained and qualified for the work. This document is a response to the observations, comments, and recommendations submitted by C. Warren Ankerberg following his review. The format of this document is to present the findings and recommendations verbatim from Mr. Ankerberg's report, followed by responses from the UMTRA Project staff. Included in the responses from the UMTRA Project staff are recommended changes in SOPs and strategies for implementing the changes.

1746 (DOE/AL/62350-31F) Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Tuba City, Arizona. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014407. Source: OSTI; NTIS; INIS; GPO Dep.

This document evaluates potential public health or environmental impacts resulting from ground water contamination at the former uranium mill site. The tailings and other contaminated material at this site were placed in a disposal cell on the site in 1990 by the US Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project. The second phase of the UMTRA Project is to evaluate ground water contamination. This risk assessment is the first site-specific document under the Ground Water Project. It

will help determine what remedial actions are necessary for contaminated ground water at the site.

1747 (DOE/AL/62350-41F) Uranium Mill Tailings Remedial Action Project Environmental Line Management Audit Action Plan. Final report. Audit, October 26, 1992-November 6, 1992. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1993. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009830. Source: OSTI; NTIS; INIS; GPO Dep.

This Action Plan contains responses, planned actions, and estimated costs for addressing the findings discovered in the Environmental Management Audit conducted for the U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action Project (UMTRA), October 26 through November 6, 1992. This document should be read in conjunction with the Audit Report to ensure the findings addressed in this document are fully understood. The scope of the UMTRA Environmental Management Audit was comprehensive and encompassed all areas of environmental management except environmental programs pertaining to the National Environmental Policy Act (NEPA) compliance. The Audit Report listed 18 findings: 11 were identified as compliance findings, and the remaining 7 were best management practice findings. Root cause analysis was performed on all the findings. The results of the analysis as well as planned corrective actions are summarized in Section 5.0. All planned actions were prioritized using the Tiger Team Assessment Corrective Action Plan system. Based on assigned priorities, all planned actions were costed by fiscal year. This Action Plan contains a description of the organizational and management structures to be used to implement the Action Plan, a brief discussion of root cause analysis and funding, followed by the responses and planned actions for each finding. A member of the UMTRA Project Office (PO) has been assigned responsibility for tracking the progress on each of the findings. The UMTRA PO staff wrote and/or approved all of the corrective actions recorded in this Action Plan.

1748 (DOE/AL/62350-43-Rev.1) Baseline risk assessment of ground water contamination at the Monument Valley Uranium Mill Tailings Site, Cane Valley, Arizona: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018466. Source: OSTI; NTIS; INIS; GPO Dep.

This baseline risk assessment evaluates potential impact to public health or the environment from ground water contamination at the former uranium mill processing site in Cane Valley near Monument Valley, Arizona. The US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project has relocated and stabilized this site's tailings and other contaminated material in a disposal cell at Mexican Hat, Utah. The second phase of the UMTRA Project is to evaluate ground water contamination. This risk assessment is the first document specific to this site for the Ground Water Project that evaluates potential health and environmental risks. It will help determine the approach required to address contaminated ground water at the site.

1749 (DOE/AL/62350-56-Rev.5) UMTRA technical assistance contractor quality assurance program plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1994. 79p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003910. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan (QAPP) provides the primary requirements for the integration of quality functions into all Technical Assistance Contractor (TAC) Project organization activities. The QAPP is the written directive authorized by the TAC Program Manager to accomplish this task and to implement procedures that provide the controls and sound management practices needed to ensure TAC contractual obligations are met. The QA program is designed to use monitoring, audit, and surveillance functions as management tools to ensure that all Project organization functions are executed in a manner that will protect public health and safety, promote the success of the Project, and meet or exceed contract requirements.

1750 (DOE/AL/62350-60F-Rev.1) Long-term surveillance plan for the Shiprock Disposal site, Shiprock, New Mexico. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001268. Source: OSTI; NTIS; INIS; GPO Dep.

The long-term surveillance plan (LTSP) for the Shiprock, New Mexico, Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site describes the surveillance activities for the Shiprock disposal cell. The U.S. Department of Energy (DOE) will carry out these activities to ensure that the disposal cell continues to function as designed. This final LTSP was prepared as a requirement for acceptance under the U.S. Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials (RRM). This LTSP documents the land ownership interests and details how the long-term care of the disposal site will be carried out. It is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program (DOE, 1992a).

1751 (DOE/AL/62350-61-Rev.1) U.S. Department of Energy Uranium Mill Tailings Remedial Action Ground Water Project: Project plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001278. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of the Project is to develop and implement a ground water compliance strategy for all 24 UMTRA Project processing sites. The compliance strategy for the processing sites must satisfy the proposed EPA ground water cleanup standards in 40 CFR Part 192, Subparts B and C (1987). This scope of work will entail the following activities on a site-specific basis: Develop a compliance strategy based on modification of the UMTRA Surface Project RAPs or develop Ground Water Project RAPs with NRC concurrence on the RAP and full participation of the affected states and tribes. Implement the RAP to include institutional controls, where appropriate, as an interim measure until compliance with the standards is achieved. Institute long-term verification monitoring for transfer to a separate long-term surveillance program on or before the Project end date. Prepare certification or confirmation reports and modify the long-term surveillance plan (LTSP), where needed, on those sites completed prior to the Project end date.

1752 (DOE/AL/62350-64-Rev.1) Baseline risk assessment of ground water contamination at the uranium

mill tailings site near Falls City, Texas: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 161p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003889. Source: OSTI; NTIS; INIS; GPO Dep.

This baseline risk assessment of ground water contamination of the uranium mill tailings site near Falls City, Texas, evaluates potential impact to public health and the environment resulting from ground water contamination at the former Susquehanna Western, Inc. (SWI), uranium mill processing site. This document fulfills the following objectives: determine if the site presents immediate or potential future health risks, determine the need for interim institutional controls, serve as a key input to project planning and prioritization, and recommend future data collection efforts to more fully characterize risk. The Uranium Mill Tailings Remedial Action (UMTRA) Project has begun its evaluation of ground water contamination at the Falls City site. This risk assessment is one of the first documents specific to this site for the Ground Water Project. The first step is to evaluate ground water data collected from monitor wells at or near the site. Evaluation of these data show the main contaminants in the Dilworth ground water are cadmium, cobalt, fluoride, iron, nickel, sulfate, and uranium. The data also show high levels of arsenic and manganese occur naturally in some areas.

1753 (DOE/AL/62350-65) Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Riverton, Wyoming. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 157p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001263. Source: OSTI; NTIS; INIS; GPO Dep.

This Risk Assessment evaluated potential impacts to public health or the environment caused by ground water contamination at the former uranium mill processing site. In the first phase of the U.S. Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project, the tailing and other contaminated material at this site were placed in a disposal cell near the Gas Hills Plant in 1990. The second phase of the UMTRA Project is to evaluate ground water contamination. This risk assessment is the first site-specific document to evaluate potential health and environmental risks for the Riverton site under the Ground Water Project; it will help determine whether remedial actions are needed for contaminated ground water at the site.

1754 (DOE/AL/62350-68F-Rev.3) Surface and sub-surface cleanup protocol for radionuclides Gunnison, Colorado, UMTRA Project Processing Site: Revision 3, Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014399. Source: OSTI; NTIS; INIS; GPO Dep.

The supplemental standards provisions of Title 40, Code of Federal Regulations, Part 192 (40 CFR Part 192) require the cleanup of radionuclides other than radium-226 (Ra-226) to levels "as low as reasonably achievable" (ALARA), taking into account site-specific conditions, if sufficient quantities and concentrations are present to constitute a significant radiation hazard. In this context, thorium-230 (Th-230) at the Gunnison, Colorado, processing site will require remediation. However, a seasonally fluctuating groundwater table at the site significantly complicates conventional remedial action with respect to cleanup. Characterization data indicate

that in the offpile areas, the removal of residual in situ bulk Ra-226 and Th-230 such that the 1000-year projected Ra-226 concentration (Ra-226 concentration in 1000 years due to the decay of in situ Ra-226 and the in-growth of Ra-226 from in situ Th-230) complies with the US Environmental Protection Agency (EPA) cleanup standard for in situ Ra-226 and the cleanup protocol for in situ Th-230 can be readily achieved using conventional excavation techniques for bulk contamination without encountering significant impacts due to groundwater. The EPA cleanup standard and criterion for Ra-226 and the 1000-year projected Ra-226 are 5 and 15 picocuries per gram (pCi/g) above background, respectively, averaged over 15-centimeter (cm) deep surface and subsurface intervals and 100-square-meter (m²) grid areas. Significant differential migration of Th-230 relative to Ra-226 has occurred over 40 percent of the subpile area. To effectively remediate the site with respect to Ra-226 and Th-230, supplemental standard is proposed and discussed in this report.

1755 (DOE/AL/62350-71) Public information plan. Version 2. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 22 Sep 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009884. Source: OSTI; NTIS; INIS; GPO Dep.

The Public Information Plan is intended to be used in conjunction with the U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project Public Participation Plan. The Public Participation Plan describes the DOE procedure for involving the public in the decision-making process related to the UMTRA Project during the stages at which public participation is required and solicited. This Public Information Plan describes the department's procedure for communicating with the public about project policies, plans, and activities. Together, these complementary plans describe the DOE public affairs program for the UMTRA Project. This project was authorized by Congress in the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, (Public Law (PL) 95-604), as amended. The Act provides for a cooperative effort with affected states and Indian tribes for the cleanup of designated abandoned or inactive uranium mill tailings sites, which are located in 10 states, 9 of them west of the Mississippi River. The public has a right to know about proposed government actions and to be heard in the planning of activities that influence their lives. The UMTRA Project is unclassified and the DOE provides accurate information about policy and project activities to interested stakeholders, including the news media, in a timely way. The DOE encourages states and local governments, as well as individuals, to join actively in the decision-making process. This is intended to ensure that the resulting decisions are made with full knowledge of the public's views and that these decisions address the public's concerns to the extent possible within the law. The DOE, through the implementation of the Public Information Plan, keeps the public informed on matters such as health concerns, environmental issues, remedial action construction plans, project costs, and specific site activities.

1756 (DOE/AL/62350-72D-Rev.1) UMTRA project technical assistance contractor quality assurance implementation plan for surface and ground water. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001272. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project Technical Assistance Contractor (TAC) Quality Assurance Implementation Plan (QAIP) outlines the primary requirements for integrating quality functions for TAC technical activities applied to the surface and ground water phases of the UMTRA Project. The QAIP is subordinate to the latest issue of the UMTRA Project TAC Quality Assurance Program Plan (QAPP). The QAIP addresses technical aspects of the TAC UMTRA Project surface and ground water programs. The QAIP is authorized and approved by the TAC Project Manager and QA manager. The QA program is designed to use monitoring, audit, and surveillance functions as management tools to ensure that all Project organization activities are carried out in a manner that will protect public health and safety, promote the success of the UMTRA Project and meet or exceed contract requirements.

1757 (DOE/AL/62350-76-Rev.6) UMTRA Project Office quality assurance program plan. Revision 6. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003915. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project was established to accomplish remedial actions at inactive uranium mill tailings sites. The UMTRA Project's mission is to stabilize and control the residual radioactive materials at designated sites in a safe and environmentally sound manner so as to minimize or eliminate radiation health hazards to the public. Because these efforts may involve possible risks to public health and safety, a quality assurance (QA) program that conforms to the applicable criteria has been established to control the quality of the work. This document, the Quality Assurance Program Plan (QAPP), brings into one document the essential criteria to be applied on a selective basis, depending upon the nature of the activity being conducted, and describes how those criteria shall be applied to the UMTRA Project. QA requirements contained in this QAPP shall apply to all personnel, processes, and activities, including planning, scheduling, and cost control, performed by the UMTRA Project Office and its contractors.

1758 (DOE/AL/62350-79-Rev.1) Uranium Mill Tailings Remedial Action Project environmental protection implementation plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003909. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project Environmental Protection Implementation Plan (EPIP) has been prepared in accordance with the requirements of the U.S. Department of Energy (DOE) Order 5400.1. The UMTRA EPIP is updated annually. This version covers the time period of 9 November 1994, through 8 November 1995. Its purpose is to provide management direction to ensure that the UMTRA Project is operated and managed in a manner that will protect, maintain, and where necessary, restore environmental quality, minimize potential threats to public health and the environment, and comply with environmental regulations and DOE policies.

1759 (DOE/AL/62350-85-Rev.1) Mitigation and Monitoring Plan for impacted wetlands at the Gunnison UMTRA Project site, Gunnison, Colorado. Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United

States). Dec 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007610. Source: OSTI; NTIS; INIS; GPO Dep.

The Gunnison, Colorado, abandoned uranium mill site is one site being cleaned up by the DOE under UMTRCA authority. This site's contaminated material is being transported to a disposal site on US Bureau of Land Management (BLM) land east of Gunnison. Remedial action activities have temporarily disturbed 0.8 acre (ac) (0.3 hectares [ha]) of wetlands and permanently eliminated 4.3 ac (1.7 ha). As required by the Clean Water Act, the US Army Corps of Engineers (USACE) prepared a Section 404 Permit that addresses the loss of wetlands as a result of remedial action at the Gunnison UMTRA Project site. The 404 permit includes this report as an attachment and it describes the wetland mitigation and monitoring plan. The DOE formulated this plan in consultation with the BLM and the USACE. This report represents a revised version of the mitigation and monitoring plan (DOE, 1992b).

1760 (DOE/AL/62350-89F-Rev.1) Long-term surveillance plan for the Green River, Utah disposal site: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018476. Source: OSTI; NTIS; INIS; GPO Dep.

The long-term surveillance plan (LTSP) for the Green River, Utah, Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site describes the surveillance activities for the Green River disposal cell. The US Department of Energy (DOE) will carry out these activities to ensure that the disposal cell continues to function as designed. This final LTSP was prepared as a requirement for acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials (RRM). This LTSP documents whether the land and interests are owned by the United States or an Indian tribe and details how the long-term care of the disposal site will be carried out. The Green River, Utah, LTSP is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program (DOE, 1992a).

1761 (DOE/AL/62350-98) UMTRA Project document control system manual. Department of Energy, Albuquerque, NM (United States). Albuquerque Operations Office. Sep 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001283. Source: OSTI; NTIS; GPO Dep.

This manual defines the Project Document Control System (PDCS) operated by the US DOE Uranium Mill tailings Remedial Action (UMTRA) project Office. The purpose of the PDCS is to provide an active and continuing program for acquiring, controlling, retaining, retrieving, retiring and disposing of all UMTRA Project documents. The PDCS also provides guidance and coordination in transferring documents by various UMTRA Project document control centers to a central location.

1762 (DOE/AL/62350-99) UMTRA project water sampling and analysis plan, Salt Lake City, Utah. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014400. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action was completed at the Salt Lake City, Utah, Uranium Mill Tailings Remedial Action (UMTRA) Project site in the fall of 1987. Results of water sampling for the years 1992 to 1994 indicate that site-related ground water contamination occurs in the shallow unconfined aquifer (the uppermost aquifer). With respect to background ground water quality, contaminated ground water in the shallow, unconfined aquifer has elevated levels of chloride, sodium, sulfate, total dissolved solids, and uranium. No contamination associated with the former tailings pile occurs in levels exceeding background in ground water in the deeper confined aquifer. This document provides the water sampling and analysis plan for ground water monitoring at the former uranium processing site in Salt Lake City, Utah (otherwise known as the "Vitro" site, named after the Vitro Chemical Company that operated the mill). All contaminated materials removed from the processing site were relocated and stabilized in a disposal cell near Clive, Utah, some 85 miles west of the Vitro site (known as the "Clive" disposal site). No ground water monitoring is being performed at the Clive disposal site, since concurrence of the remedial action plan by the US Nuclear Regulatory Commission and completion of the disposal cell occurred before the US Environmental Protection Agency issued draft ground water standards in 1987 (52 FR 36000) for cleanup, stabilization, and control of residual radioactive materials at the disposal site. In addition, the likelihood of post-closure impact on the ground water is minimal to nonexistent, due to the naturally poor quality of the ground water. Water sampling activities planned for calendar year 1994 consist of sampling ground water from nine monitor wells to assess the migration of contamination within the shallow unconfined aquifer and sampling ground water from two existing monitor wells to assess ground water quality in the confined aquifer.

1763 (DOE/AL/62350-101) Uranium Mill Tailings Remedial Action Project 1993 Environmental Report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1994. 441p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003918. Source: OSTI; NTIS; INIS; GPO Dep.

This annual report documents the Uranium Mill Tailings Remedial Action (UMTRA) Project environmental monitoring and protection program. The UMTRA Project routinely monitors radiation, radioactive residual materials, and hazardous constituents at associated former uranium tailings processing sites and disposal sites. At the end of 1993, surface remedial action was complete at 10 of the 24 designated UMTRA Project processing sites. In 1993 the UMTRA Project office revised the UMTRA Project Environmental Protection Implementation Plan, as required by the US DOE. Because the UMTRA Project sites are in different stages of remedial action, the breadth of the UMTRA environmental protection program differs from site to site. In general, sites actively undergoing surface remedial action have the most comprehensive environmental programs for sampling media. At sites where surface remedial action is complete and at sites where remedial action has not yet begun, the environmental program consists primarily of surface water and ground water monitoring to support site characterization, baseline risk assessments, or disposal site performance assessments.

1764 (DOE/AL/62350-104) Baseline risk assessment of ground water contamination at the Uranium Mill

Tailings Site near Grand Junction, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018484. Source: OSTI; NTIS; INIS; GPO Dep.

This Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Grand Junction, Colorado evaluates potential impacts to public health or the environment resulting from ground water contamination at the former uranium mill processing site. The tailings and other contaminated material at this site were placed in an off-site disposal cell by the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. The remedial activities at the site were conducted from 1989 to 1993. Currently, the UMTRA Project is evaluating ground water contamination. This risk assessment is the first document specific to this site for the Ground Water Project. This risk assessment evaluates the most contaminated ground water that flows beneath the processing site toward the Colorado River. The monitor wells that have consistently shown the highest concentrations of most contaminants are used to assess risk. This risk assessment will be used in conjunction with additional activities and documents to determine what remedial action may be needed for contaminated ground water at the site. This risk assessment follows an approach outlined by the EPA. The first step is to evaluate ground water data collected from monitor wells at the site. Evaluation of these data showed that the contaminants of potential concern in the ground water are arsenic, cadmium, cobalt, fluoride, iron, manganese, molybdenum, nickel, sulfate, uranium, vanadium, zinc, and radium-226. The next step in the risk assessment is to estimate how much of these contaminants people would be exposed to if they drank from a well installed in the contaminated ground water at the former processing site.

1765 (DOE/AL/62350-104-Rev.1) Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site at Grand Junction, Colorado: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001261. Source: OSTI; NTIS; INIS; GPO Dep.

This risk assessment evaluates potential impacts to public health or the environment resulting from ground water contamination at the former uranium mill processing site. The tailings and other contaminated material at this site were placed in an off-site disposal cell by the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. The remedial activities at the site were conducted from 1989 to 1993. Currently, the UMTRA Project is evaluating ground water contamination. This risk assessment evaluates the most contaminated ground water that flows beneath the processing site toward the Colorado River. The monitor wells that have consistently shown the highest concentrations of most contaminants are used to assess risk. This risk assessment will be used in conjunction with additional activities and documents to determine what remedial action may be needed for contaminated ground water at the site.

1766 (DOE/AL/62350-108-Rev.1) UMTRA project office federal employee occupational safety and health program plan: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 27p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC04-91AL62350. Order Number DE94014404. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the Federal Employee Occupational Safety and Health (FEOSH) Program for the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project Office. This program will ensure compliance with applicable requirements of DOE Order 3790.1B and DOE Albuquerque Operations Office (AL) Order 3790.1A. FEOSH Program responsibilities delegated by the DOE-AL to the UMTRA Project Office by AL Order 3790.1A also are assigned. The UMTRA Project Office has developed the UMTRA Project Environmental, Safety, and Health (ES&H) Plan (DOE, 1992), which establishes the basic programmatic ES&H requirements for all participants on the UMTRA Project. The ES&H plan is designed primarily to cover remedial action activities at UMTRA sites and defines the ES&H responsibilities of both the UMTRA Project Office and its contractors. The UMTRA FEOSH Program described herein is a subset of the overall UMTRA ES&H program and covers only federal employees working on the UMTRA Project.

1767 (DOE/AL/62350-110-Rev.1) Gunnison, Colorado subpile study report: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018472. Source: OSTI; NTIS; INIS; GPO Dep.

To protect human health and the environment, the Uranium Mill Tailings Remedial Action (UMTRA) Project will remediate the uranium mill tailings site at Gunnison Colorado. There are explicit requirements (i.e., 40 CFR Part 192) for the surface remediation of radiologically contaminated soils on UMTRA sites. The removal of subpile sediment to the depth required by 40 CFR Part 192 will leave in place deeper foundation sediment that is contaminated with hazardous constituents other than radium-226 and thorium-230. The Department of Energy and the Colorado Department of Health have questioned whether this contaminated soil could potentially act as a continuing source of ground water contamination even after surface remediation based on 40 CFR Part 192 is complete. To evaluate the subpile sediments as a potential source of ground water contamination, the Gunnison Subpile study was initiated. This report summarizes the results and findings of this study.

1768 (DOE/AL/62350-113) Response to the Independent technical review of the UMTRA Project procedures and practices for well drilling and development. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018460. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a response to the findings and recommendations contained in the ITR report. The text of this document summarizes each ITR finding and recommendation, presents the TAC response, and concludes that implementation of many of the recommendations would benefit the UMTRA Project. Implementation of the recommendations represents ongoing improvement to the TAC well installation and development procedures and will result, in lower overall project costs. Appendix B is an implementation plan that groups similar or complementary action items, provides a schedule for implementation, identifies the group or people responsible for the changes, and estimates hours to implement the changes. The four major action items are

as follows: (1) ITR Reevaluation, (2) Well Installation SOP Review and Revision, (3) Well Installation Contract Review and Revision, and (4) TAC and DOE Communications Improvement. The hours listed to implement the improvements are intended to be estimates for budgeting and planning purposes for the remainder of this fiscal year and the upcoming fiscal year.

1769 (DOE/AL/62350-116) Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Green River, Utah. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003908. Source: OSTI; NTIS; INIS; GPO Dep.

This document evaluates potential impacts to public health and the environment resulting from ground water contamination at the former uranium mill processing site. The tailings and other contaminated material at this site were placed in a disposal cell on the site in 1989 by the US DOE's Uranium Mill Tailings Remedial Action (UMTRA) Project. Currently, UMTRA Project is evaluating ground water contamination in this risk assessment.

1770 (DOE/AL/62350-120) Baseline risk assessment of ground water contamination at the inactive uriferous lignite ashing site near Belfield, North Dakota. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018464. Source: OSTI; NTIS; INIS; GPO Dep.

This Baseline Risk Assessment of Ground Water Contamination at the Inactive Uraniferous Lignite Ashing Site Near Belfield, North Dakota, evaluates potential impacts to public health or the environment resulting from ground water contamination at the site where coal containing uranium was burned to produce uranium. The US Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project is evaluating plans to remedy soil and ground water contamination at the site. Phase I of the UMTRA Project consists of determining the extent of soil contamination. Phase II of the UMTRA Project consists of evaluating ground water contamination. Under Phase II, results of this risk assessment will help determine what remedial actions may be necessary for contaminated ground water at the site. This risk assessment evaluates the potential risks to human health and the environment resulting from exposure to contaminated ground water as it relates to historic processing activities at the site. Potential risk is quantified for constituents introduced from the processing activities, and not for those constituents naturally occurring in water quality in the site vicinity. Background ground water quality has the potential to cause adverse health effects from exposure through drinking. Any risks associated with contaminants attributable to site activities are incremental to these risks from background ground water quality. This incremental risk from site-related contaminants is quantified in this risk assessment. The baseline risk from background water quality is incorporated only into the assessment of potential chemical interactions and the definition of the overall site condition.

1771 (DOE/AL/62350-120-Rev.1) Baseline risk assessment of ground water contamination at the inactive uriferous lignite ashing site near Belfield, North Dakota. Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 124p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001259. Source: OSTI; NTIS; INIS; GPO Dep.

This risk assessment evaluates the potential for impacts to public health or the environment from contaminated ground water at this site caused by the burning of coal containing uranium to produce uranium. Potential risk is quantified for constituents introduced from the processing activities and not for those constituents naturally occurring in background ground water in the site vicinity. Because background ground water quality has the potential to cause adverse health effects from exposure through drinking, any risks associated with contaminants attributable to site activities are incremental to these risks from background. The incremental risk from site-related contaminants is quantified in this risk assessment. The baseline risk from background water quality is incorporated only into the assessment of potential chemical interactions and the definition of the overall site condition. The US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project is developing plans to remedy soil and ground water contamination at the site. The UMTRA Surface Project consists of determining the extent of soil contamination and disposing of the contaminated soils in an engineered disposal cell. The UMTRA Ground Water Project consists of evaluating ground water contamination. Under the UMTRA Ground Water Project, results of this risk assessment will help determine what ground water compliance strategy may be applied at the site.

1772 (DOE/AL/62350-121F) UMTRA project water sampling and analysis plan, Naturita, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014405. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action is scheduled to begin at the Naturita UMTRA Project processing site in the spring of 1994. No water sampling was performed during 1993 at either the Naturita processing site (NAT-01) or the Dry Flats disposal site (NAT-12). Results of previous water sampling at the Naturita processing site indicate that ground water in the alluvium is contaminated as a result of uranium processing activities. Baseline ground water conditions have been established in the uppermost aquifer at the Dry Flats disposal site. Water sampling activities scheduled for April 1994 include preconstruction sampling of selected monitor wells at the processing site, surface water sampling of the San Miguel River, sampling of several springs/seeps in the vicinity of the disposal site, and sampling of two monitor wells in Coke Oven Valley. The monitor well locations provide sampling points to characterize ground water quality and flow conditions in the vicinity of the sites. The list of analytes has been updated to reflect constituents related to uranium processing activities and the parameters needed for geochemical evaluation. Water sampling will be conducted annually at minimum during the period of construction activities.

1773 (DOE/AL/62350-125) UMTRA project water sampling and analysis plan, Maybell, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014406. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) describes planned water sampling activities and provides the regulatory and technical basis for ground water sampling in 1994

at the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site in Maybell, Colorado. The WSAP identifies and justifies sampling locations, analytical parameters, and sampling frequencies at the site. The ground water data will be used for site characterization and risk assessment. The regulatory basis for the ground water and surface water monitoring activities is derived from the EPA regulations in 40 CFR Part 192 (1993) and the proposed EPA standards of 1987 (52 FR 36000). Sampling procedures are guided by the UMTRA Project standard operating procedures (SOP) (JEG, n.d.), the Technical Approach Document (TAD) (DOE, 1989), and the most effective technical approach for the site. This WSAP also includes a summary and the results of water sampling activities from 1989 through 1992 (no sampling was performed in 1993).

1774 (DOE/AL/62350-127) Analysis of cobbly soils for cobbles-to-fines corrections to radionuclide concentrations at the New Rifle, Colorado, processing site. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1994. 228p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018458. Source: OSTI; NTIS; INIS; GPO Dep.

A contamination depth and cobbly soil characterization study was performed in November and December 1993 at the Uranium Mill Tailings Remedial Action (UMTRA) Project's New Rifle, Colorado, processing site. This study was initiated due to a concurrence by the US Nuclear Regulatory Commission (NRC) clarifying that the allowable residual contamination in soil should be averaged over the total mass of the soil volume, including cobbles and gravels (i.e., bulk concentration). The New Rifle processing site has a high percentage of cobbles and gravels underlying the pile and other contaminated areas, which preliminary excavation designs have identified for removal and disposal. The main purpose of this study was to evaluate the relative mass percentage and radionuclide concentrations of cobbles and gravels in order to determine the bulk contamination concentrations, revise the underlying excavation design depths, and improve verification methods. Another important goal of the study was to acquire more accurate contamination depth data (profile) for the subpile material. In summary, this recharacterization study will probably reduce the volume of material for excavation/disposal by several hundred thousand cubic yards and significantly reduce the amount of ground water expected to be pumped out of the excavation during cleanup.

1775 (DOE/AL/62350-128) Comment and response document for the long-term surveillance plan for the Collins Ranch Disposal Site, Lakeview, Oregon. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018482. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains comments made by the U.S. Nuclear Regulatory Commission addressing their concerns over the long-term monitoring program for the Collins Ranch Disposal Site, UMTRA project. Responses are included as well as plans for implementation of changes, if any are deemed necessary.

1776 (DOE/AL/62350-129-Rev.1) Completion report for the UMTRA Project Vitro Processing Site. Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM

(United States). Mar 1995. 468p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009881. Source: OSTI; NTIS; INIS; GPO Dep.

This completion report provides evidence that the final Salt Lake City, Utah, processing site property conditions are in accordance with the approved design and that all US Environmental Protection Agency (EPA) standards have been satisfied. Included as appendixes to support the stated conclusions are the record drawings; a summary of grid test results; contract specifications and construction drawings, the EPA standards (40 CFR Part 192); the audit, inspection, and surveillance summary; the permit information; and project photographs. The principal objective of the remedial action at Salt Lake City is to remove the tailings from the Vitro processing site, render the site free of contamination to EPA standards, and restore the site to the final design grade elevations. The final remedial action plan (RAP), which is approved by the US Department of Energy (DOE) and concurred upon by the US Nuclear Regulatory Commission (NRC) and the state of Utah, contains the conceptual design used to develop the final approved design. During remedial action construction operations, conditions were encountered that required design features that differed from the conceptual design. These conditions and the associated design changes are noted in the record drawings. All remedial action activities were completed in conformance with the specifications and drawings; the record drawings, in the state of Utah's opinion, reflect an accurate depiction of the existing property conditions at the processing site. 25 refs., 3 figs., 22 tabs.

1777 (DOE/AL/62350-130) Comment and response document for the UMTRA Project vitro processing site completion report Salt Lake City, Utah. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1995. 499p. DOE Contract AC04-91AL62350. Order Number DE95009880. Source: OSTI; NTIS; INIS; GPO Dep.

This Comment and Response Document is a series of UMTRA document review forms regarding the UMTRA Project Vitro Processing Site Completion Report for Salt Lake City, Utah in March, 1995. The completion report provides evidence that the final Salt Lake City, Utah, processing site property conditions are in accordance with the approved design and that all U.S. Environmental Protection Agency (EPA) standards have been satisfied. Included as appendixes to support the stated conclusions are the record drawings; a summary of grid test results; contract specifications and construction drawings, the EPA standards (40 CFR Part 192); the audit, inspection, and surveillance summary; the permit information; and project photographs. The principal objective of the remedial action at Salt Lake City is to remove the tailings from the processing site, render the site free of contamination to EPA standards, and restore the site to the final design grade elevations. Each section is evaluated in detail to check all aspects of above report, especially the inclusion of adequate verification data. Each review form contains a section entitled State of Utah Response and Action, which is an explanation or correction of DOE criticisms of the report.

1778 (DOE/AL/62350-132) UMTRA project water sampling and analysis plan, Gunnison, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014403. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan summarizes the results of previous water sampling activities and the plan for water sampling activities for calendar year 1994. A buffer zone monitoring plan is included as an appendix. The buffer zone monitoring plan is designed to protect the public from residual contamination that entered the ground water as a result of former milling operations. Surface remedial action at the Gunnison Uranium Mill Tailings Remedial Action Project site began in 1992; completion is expected in 1995. Ground water and surface water will be sampled semiannually in 1994 at the Gunnison processing site (GUN-01) and disposal site (GUN-08). Results of previous water sampling at the Gunnison processing site indicate that ground water in the alluvium is contaminated by the former uranium processing activities. Background ground water conditions have been established in the uppermost aquifer (Tertiary gravels) at the Gunnison disposal site. The monitor well locations provide a representative distribution of sampling points to characterize ground water quality and ground water flow conditions in the vicinity of the sites. The list of analytes has been modified with time to reflect constituents that are related to uranium processing activities and the parameters needed for geochemical evaluation. Water sampling will be conducted at least semiannually during and one year following the period of construction activities, to comply with the ground water protection strategy discussed in the remedial action plan (DOE, 1992a).

1779 (DOE/AL/62350-132-Rev.1) **UMTRA Project water sampling and analysis plan, Gunnison, Colorado: Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003886. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan summarizes the results of previous water sampling activities and the plan for future water sampling activities, in accordance with the Guidance Document for Preparing Sampling and Analysis Plans for UMTRA Sites. A buffer zone monitoring plan for the Dos Rios Subdivision is included as an appendix. The buffer zone monitoring plan was developed to ensure continued protection to the public from residual contamination. The buffer zone is beyond the area depicted as contaminated ground water due to former milling operations. Surface remedial action at the Gunnison Uranium Mill Tailings Remedial Action Project site began in 1992; completion is expected in 1995. Ground water and surface water will be sampled semiannually at the Gunnison processing site and disposal site. Results of previous water sampling at the Gunnison processing site indicate that ground water in the alluvium is contaminated by the former uranium processing activities. Background ground water conditions have been established in the uppermost aquifer at the Gunnison disposal site. The monitor well locations provide a representative distribution of sampling points to characterize ground water quality and ground water flow conditions in the vicinity of the sites. The list of analytes has been modified with time to reflect constituents that are related to uranium processing activities and the parameters needed for geochemical evaluation.

1780 (DOE/AL/62350-133) **UMTRA project water sampling and analysis plan, Grand Junction, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1994. 40p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018480. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action will be completed at the Grand Junction processing site during the summer of 1994. Results of 1993 water sampling indicate that ground water flow conditions and ground water quality at the processing site have remained relatively constant with time. Uranium concentrations in ground water continue to exceed the maximum concentration limits, providing the best indication of the extent of contaminated ground water. Evaluation of surface water quality of the Colorado River indicate no impact from uranium processing activities. No compliance monitoring at the Cheney disposal site has been proposed because ground water in the Dakota Sandstone (uppermost aquifer) is classified as limited-use (Class 111) and because the disposal cell is hydrogeologically isolated from the uppermost aquifer. The following water sampling and water level monitoring activities are planned for calendar year 1994: (i) Semiannual (early summer and late fall) sampling of six existing monitor wells at the former Grand Junction processing site. Analytical results from this sampling will be used to continue characterizing hydrogeochemical trends in background ground water quality and in the contaminated ground water area resulting from source term (tailings) removal. (ii) Water level monitoring of approximately three proposed monitor wells projected to be installed in the alluvium at the processing site in September 1994. Data loggers will be installed in these wells, and water levels will be electronically monitored six times a day. These long-term, continuous ground water level data will be collected to better understand the relationship between surface and ground water at the site. Water level and water quality data eventually will be used in future ground water modeling to establish boundary conditions in the vicinity of the Grand Junction processing site. Modeling results will be used to help demonstrate and document the potential remedial alternative of natural flushing.

1781 (DOE/AL/62350-134) **Baseline risk assessment of ground water contamination at the uranium mill tailings site Salt Lake City, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003911. Source: OSTI; NTIS; INIS; GPO Dep.

This baseline risk assessment of groundwater contamination at the uranium mill tailings site near Salt Lake City, Utah, evaluates potential public health or environmental impacts resulting from ground water contamination at the former uranium ore processing site. The tailings and other contaminated material at this site were placed in a disposal cell located at Clive, Utah, in 1987 by the US Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project. The second phase of the UMTRA Project is to evaluate residual ground water contamination at the former uranium processing site, known as the Vitro processing site. This risk assessment is the first site-specific document under the Ground Water Project. It will help determine the appropriate remedial action for contaminated ground water at the site.

1782 (DOE/AL/62350-135) **UMTRA Project water sampling and analysis plan, Belfield and Bowman, North Dakota.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018471. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action is scheduled to begin at the Belfield and Bowman Uranium Mill Tailings Remedial Action (UMTRA) Project sites in the spring of 1996. Water sampling was conducted in 1993 at both the Belfield processing site and the Bowman processing/disposal site. Results of the sampling at both sites indicate that ground water conditions have remained relatively stable over time. Water sampling activities are not scheduled for 1994 because ground water conditions at the two sites are relatively stable, the 1993 sampling was comprehensive, and surface remediation activities are not scheduled to start until 1996. The next water sampling event is scheduled before the start of remedial activities and will include sampling selected monitor wells at both sites and several domestic wells in the vicinity.

1783 (DOE/AL/62350-136) Comment and response document for the final long-term surveillance plan for the Green River, Utah, disposal site. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018479. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains comments made by the U.S. Nuclear Regulatory Commission addressing their concerns over the long-term monitoring program for the Green River Disposal Site, UMTRA project. Responses are included as well as plans for implementation of changes, if any are deemed necessary.

1784 (DOE/AL/62350-137) Work plan for ground water elevation data recorder/monitor well installation at the New Rifle Site, Rifle, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 18 Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018461. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the New Rifle Uranium Mill Tailings Remedial Action (UMTRA) Project site, Rifle, Colorado. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between the shallow aquifer and the Colorado River.

1785 (DOE/AL/62350-137-Rev.1) Work plan for ground water elevation data recorder/monitor well installation at the New Rifle Site, Rifle, Colorado: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018473. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the New Rifle Uranium Mill Tailings Remedial Action (UMTRA) Project site, Rifle, Colorado. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between the shallow aquifer and the Colorado River.

1786 (DOE/AL/62350-138) Work plan for ground water elevation data recorder/monitor well injection at Grand Junction, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 18 Jul 1994.

10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018462. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Grand Junction, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between the shallow aquifer and the Colorado River. Data collection objectives (DCO) identify reasons for collecting data. The following are DCOs for the Grand Junction ground water elevation data recorder/monitor well installation project: long-term continuous ground water level data and periodic ground water samples will be collected to better understand the relationship between surface and ground water at the site; water level and water quality data will eventually be used in future ground water modeling to more firmly establish boundary conditions in the vicinity of the Grand Junction processing site; modeling results will be used to demonstrate and document the potential remedial alternative of natural flushing.

1787 (DOE/AL/62350-138-Rev.1) Work plan for ground water elevation data recorder/monitor well installation at Grand Junction, Colorado: Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018474. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Grand Junction, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between the shallow aquifer and the Colorado River.

1788 (DOE/AL/62350-139) Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 18 Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018463. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Gunnison, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between ground water and surface water in the area. Data collection objectives (DCO) identify reasons for collecting data. The following are DCOs for the Gunnison ground water elevation data recorder/monitor well installation project: long-term continuous ground water level data and periodic ground water samples will be collected to better understand the relationship between surface and ground water at the site; water level and water quality data will eventually be used in future ground water modeling to more firmly establish boundary conditions in the vicinity of the Gunnison processing site; and modeling results will be

used to demonstrate and document the potential remedial alternative of natural flushing.

1789 (DOE/AL/62350-139-Rev.1) **Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado: Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018475. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Gunnison, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between ground water and surface water in the area. Data collection objectives (DCO) identify reasons for collecting data. The following are DCOs for the Gunnison ground water elevation data recorder/monitor well installation project: long-term continuous ground water level data and periodic ground water samples will be collected to better understand the relationship between surface and ground water at the site; water level and water quality data will eventually be used in future ground water modeling to more firmly establish numerical model boundary conditions in the vicinity of the Gunnison processing site; and modeling results will be used to demonstrate and document the potential remedial alternative of natural flushing.

1790 (DOE/AL/62350-139-Rev.2) **Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado: Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018485. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Gunnison, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between ground water and surface water in the area.

1791 (DOE/AL/62350-140) **Chemical hygiene plan.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001264. Source: OSTI; NTIS; INIS; GPO Dep.

This plan was written to administer and monitor safety measures and chemical hygiene principles in the TAC Uranium Mill Tailings Remedial Action Project sample preparation facility in Albuquerque, New Mexico. It applies to toxic and/or hazardous materials to radioactive materials.

1792 (DOE/AL/62350-141) **UMTRA project water sampling and analysis plan, Old and New Rifle, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018481. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action at the Rifle, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site began in

the spring of 1992. Results of water sampling at the Old and New Rifle processing sites for recent years indicate that ground water contamination occurs in the shallow unconfined alluvial aquifer (the uppermost aquifer) and less extensively in the underlying Wasatch Formation. Uranium and sulfate continue to exceed background ground water concentrations and/or maximum concentration limits at and downgradient from the former processing sites. These constituents provide the best indication of changes in contaminant distribution. Contamination in the uppermost (alluvial) aquifer at New Rifle extends a minimum of approximately 5000 feet (ft) (1,524 meters [m]) downgradient. At Old Rifle, the extent of contamination in the alluvial aquifer is much less (a minimum of approximately 1,000 ft [305 m]), partially due to differences in hydrologic regime. For example, the Old Rifle site lies in a relatively narrow alluvial floodplain; the New Rifle site lies in a broad floodplain. Data gathering for the Rifle baseline risk assessment is under way. The purpose of this effort is to determine with greater precision the background ground water quality and extent of ground water contamination at the processing sites. Historical surface water quality indicates that the Colorado River has not been affected by uranium processing activities. No compliance monitoring of the Estes Gulch disposal cell has been proposed, because ground water in the underlying Wasatch Formation is limited use (Class 111) ground water and because the disposal cell is hydrogeologically isolated from the uppermost aquifer.

1793 (DOE/AL/62350-142) **Remedial action plan for the inactive Uranium Processing Site at Naturita, Colorado: Remedial action plan: Attachment 2, Geology report, Attachment 3, Ground water hydrology report: Working draft.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 398p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001266. Source: OSTI; NTIS; INIS; GPO Dep.

The uranium processing site near Naturita, Colorado, is one of 24 inactive uranium mill sites designated to be cleaned up by the US Department of Energy (DOE) under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), 42 USC §7901 et seq. Part of the UMTRCA requires that the US Nuclear Regulatory Commission (NRC) concur with the DOE's remedial action plan (RAP) and certify that the remedial action conducted at the site complies with the standards promulgated by the US Environmental Protection Agency (EPA). This RAP serves two purposes. First, it describes the activities that are proposed by the DOE to accomplish remediation and long-term stabilization and control of the radioactive materials at the inactive uranium processing site near Naturita, Colorado. Second, this RAP, upon concurrence and execution by the DOE, the state of Colorado, and the NRC, become Appendix B of the cooperative agreement between the DOE and the state of Colorado.

1794 (DOE/AL/62350-143) **Comment and response document for the long-term surveillance plan for the Shiprock, New Mexico, disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001282. Source: OSTI; NTIS; GPO Dep.

This document contains comments and responses regarding the long-term surveillance plan for the Shiprock, New Mexico uranium mine tailings disposal site. Discrepancies

and errors within the plan document are noted and corrections are recorded.

1795 (DOE/AL/62350-144) Uranium Mill Tailings remedial action project waste minimization and pollution prevention awareness program plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018477. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this plan is to establish a waste minimization and pollution prevention awareness (WM/PPA) program for the U.S. Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. The program satisfies DOE requirements mandated by DOE Order 5400.1. This plan establishes planning objectives and strategies for conserving resources and reducing the quantity and toxicity of wastes and other environmental releases.

1796 (DOE/AL/62350-145) Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site in Lakeview, Oregon. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1994. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001273. Source: OSTI; NTIS; INIS; GPO Dep.

This Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site in Lakeview, Oregon evaluates potential impacts to public health or the environment resulting from ground water contamination at the former uranium mill processing site.

1797 (DOE/AL/62350-146) UMTRA Project water sampling and analysis plan, Slick Rock, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018486. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) provides the regulatory and technical basis for ground water and surface water sampling at the Uranium Mill Tailings Remedial Action (UMTRA) Project Union Carbide (UC) and North Continent (NC) processing sites and the proposed Burro Canyon disposal site near Slick Rock, Colorado for the upcoming year. It identifies and justifies the sampling locations, analytical parameters, and sampling frequencies. The WSAP bridges water quality characterization and data collection objectives for the surface remediation program (Subpart A) and the ground water compliance program (Subpart B) identified in 40 CFR Part 192 (1994).

1798 (DOE/AL/62350-148) Work plan for ground water elevation data recorder installation at Riverton, Wyoming. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018478. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water elevation data recorders (data loggers) at the Riverton, Wyoming, Uranium Mill Tailings Remedial Action (UMTRA) Project site. Previous investigations conducted at the Riverton site to date supports a preliminary determination regarding the selection of ground water remediation alternatives appropriate to this site. Although ground water modeling employing existing

data indicates that a natural flushing strategy may be appropriate, additional site-specific data are needed to confirm the applicability and feasibility of this remedial option. The data loggers will be used to gather required time-dependent data to investigate the interaction between ground water and surface water in the area.

1799 (DOE/AL/62350-149) Baseline risk assessment of ground water contamination at the uranium mill tailings site near Canonsburg, Pennsylvania. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003890. Source: OSTI; NTIS; INIS; GPO Dep.

This baseline risk assessment evaluates potential impacts to public health and the environment resulting from ground water contamination from past activities at the former uranium processing site in Canonsburg, Pennsylvania. The US Department of Energy Uranium Mill Tailings Remedial Action (UMTRA) Project has placed contaminated material from this site in an on-site disposal cell. Currently, the UMTRA Project is evaluating ground water contamination. This risk assessment is the first document specific to this site for the UMTRA Ground Water Project. Currently, no domestic or drinking water well tap into contaminated ground water of the two distinct ground water units: the unconsolidated materials and the bedrock. Because there is no access, no current health or environmental risks are associated with the direct use of the contaminated ground water. However, humans and ecological organisms could be exposed to contaminated ground water if a domestic well were to be installed in the unconsolidated materials in that part of the site being considered for public use (Area C). The first step is evaluating ground water data collected from monitor wells at the site. For the Canonsburg site, this evaluation showed the contaminants in ground water exceeding background in the unconsolidated materials in Area C are ammonia, boron, calcium, manganese, molybdenum, potassium, strontium, and uranium.

1800 (DOE/AL/62350-152) Uranium Mill Tailings Remedial Action Project surface project management plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001270. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Management Plan describes the planning, systems, and organization that shall be used to manage the Uranium Mill Tailings Remedial Action Project (UMTRA). US DOE is authorized to stabilize and control surface tailings and ground water contamination at 24 inactive uranium processing sites and associated vicinity properties containing uranium mill tailings and related residual radioactive materials.

1801 (DOE/AL/62350-152-Rev.1) Uranium Mill Tailings Remedial Action Project, Surface Project Management Plan. Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007605. Source: OSTI; NTIS; INIS; GPO Dep.

Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA) authorizes the US Department of Energy (DOE) to undertake remedial action at 24 designated inactive uranium processing sites and associated vicinity properties

(VP) containing uranium mill tailings and related residual radioactive materials. The purpose of the Uranium Mill Tailings Remedial Action (UMTRA) Surface Project is to minimize or eliminate radiation health hazards to the public and the environment at the 24 sites and related VPs. This document describes the management organization, system, and methods used to manage the design, construction, and other activities required to clean up the designated sites and associated VPs, in accordance with the UMTRCA.

1802 (DOE/AL/62350-153) UMTRA Project Site Observational Work Plan, Mexican Hat, Utah. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 360p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003916. Source: OSTI; NTIS; INIS; GPO Dep.

Surface cleanup activities at the Mexican Hat UMTRA processing site are nearing completion. Ground Water contamination at the Mexican Hat site is a result of uranium milling operations. The extent of residual process water has been identified, and it is limited to the uppermost aquifer in the vicinity of the site. Deeper aquifers are not affected because of an upward hydraulic gradient and the presence of a confining unit (the deeper aquifers are protected by hydrogeologic isolation). The uppermost unit is returning to its pre-milling, mainly unsaturated state. The unit that contains the contaminated water is not a ground water resource because it qualifies as Class III (limited use) based on limited yield. Ground water in the uppermost unit is currently not used and is not anticipated to be used as a ground water resource. The nearby San Juan River and a converted oil exploration well provide all of the water needs for the area. There are no current threats to human health or livestock; and, because the zone of contamination does not represent a ground water resource, none are anticipated in the future. There are, however, seeps where contaminated water is exposed at land surface. The seeps create potential exposure pathways for plants and wildlife. It is not known at this time if there is a risk to the environment. Additional investigations are needed and are described in this document to confirm the presence or absence of potential environmental risks. Additional hydrogeologic investigations are not required. The proposed ground water compliance strategy for the site is no remediation, because the ground water in the uppermost aquifer (which is also the zone of contamination) qualifies for supplemental standards based on Class III, limited yield, and because there are no threats to human health. Domestic and agricultural water is pumped from a deeper aquifer that is isolated from the contaminated zone.

1803 (DOE/AL/62350-154) Public affairs plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001274. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Uranium Mill Tailings Remedial Action (UMTRA) Project Public Affairs Plan is to establish goals for the Fiscal Year 1995 UMTRA public affairs program and identify specific activities to be conducted during the year. It also describes the roles of various agencies involved in the conduct of the public affairs program and defines the functions of the Technical Assistance Contractor (TAC) Public Affairs Department. It integrates and replaces the Public Participation Plan (DOE/AL/62350-47D) and Public Information Plan (DOE/AL/62350-71). The plan describes the US Department of Energy's (DOE) plans to keep stakeholders

and other members of the public informed about project policies, plans, and activities, and provide opportunities for stakeholders and interested segments of the public to participate in project decision-making processes. The plan applies to the UMTRA Project Office; the DOE Albuquerque Operations Office, Office of Intergovernmental and External Affairs (OIEA); the UMTRA TAC; the UMTRA Remedial Action Contractor (RAC); and other cooperating agencies.

1804 (DOE/AL/62350-155) Technical assistance contractor management plan: Surface and ground water. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001267. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the general management structure of the Technical Assistance Contractor (TAC) for the Uranium Mill Tailings Remedial Action (UMTRA) Project. This team is a partnership of four major private subcontractors, which teamed together, are striving to be the leader in environmental restoration of uranium mining and milling operations. It will provide a pool of experts in various aspects of the technologies necessary to accomplish this goal, available to DOE to deal with mission concerns. The report expands on goals from TAC's mission statement, which include management concerns, environment, safety, and health, quality, technical support, communications, and personnel.

1805 (DOE/AL/62350-156) Site observational work plan for the UMTRA Project site at Spook, Wyoming. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 459p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001258. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water in the uppermost aquifer beneath and downgradient from the Spook site was contaminated by uranium-processing activities that occurred from 1962 until 1966. Contamination from the tailings pile and the acid pond (including uranium, selenium, nitrate, and radium-226 and -228) leached into the subsurface by infiltration and migrated into ground water, forming a plume extending approximately 2,500 feet (ft) (760 meters [m]) downgradient from the site. The surface remedial action at the Spook site under Subpart A of 40 CFR Part 192 consisted of stabilizing the uranium mill tailings and other residual radioactive materials in a disposal cell in the bottom of the Spook open-pit mine and covering the cell with overburden material. The ground water protection strategy was supplemental standards based on Class 3 ground water in the uppermost aquifer because of widespread ambient contamination. The proposed ground water protection strategy to comply with Subpart B of 40 CFR Part 192 at the Spook site is to perform no remediation. This strategy is based on ground water in the uppermost aquifer (also the zone of contamination) being classified as Class 3, which allows the application of supplemental standards. Class 3 ground water beneath the Spook site is neither a current nor a potential source of drinking water because of widespread, ambient contamination that cannot be cleaned up using treatment methods reasonably employed in public water supply systems.

1806 (DOE/AL/62350-157) Site observational work plan for the UMTRA project site at Falls City, Texas. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 91p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001281. Source: OSTI; NTIS; INIS; GPO Dep.

During surface remedial action, an estimated 7.0 million tons (6.4 million tonnes) of uranium mill tailings and other contaminated materials were consolidated and stabilized on the Falls City site. The ground water protection strategy at the Falls City disposal site for the UMTRA Surface Project (Subpart A of 40 CFR Part 192 (1994)) was an application for supplemental standards, based on Class III (limited use) ground water in the uppermost aquifer. This water is not a current or potential source of drinking water. Ground water from the uppermost aquifer (ground water from the Deweesville/Conquista Members and the Dilworth Member) contains widespread ambient contamination resulting from naturally occurring conditions and from the effects of human activity not related to uranium milling operations (uranium exploration and mining activities). The ground water cannot be effectively cleaned up for drinking or other beneficial purposes using treatment methods reasonably employed by public water supply systems. The U.S. Nuclear Regulatory Commission (NRC) and the state of Texas concurred with the ground water protection strategy for the disposal site in September 1992. Surface remedial action in accord with Subpart A was completed in April 1994. The proposed ground water compliance strategy (Subpart B of 40 CFR Part 192 (1994)) at the Falls City site is to perform no remedial action based on application for supplemental standards because the ground water in the uppermost aquifer is classified as Class III ground water. Class III ground water includes ground water that is not a current or potential source of drinking water because of widespread, ambient contamination that cannot be cleaned up using treatment methods reasonably employed by public water supply systems (40 CFR § 192.11 (e) (1994)). Although supplemental standards are being applied, the potential use of ground water in the site vicinity will be protected.

1807 (DOE/AL/62350-158) **Site observational work plan for the UMTRA project site at Shiprock, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001269. Source: OSTI; NTIS; INIS; GPO Dep.

The site observational work plan (SOWP) for the Shiprock, New Mexico, Uranium Mill Tailings Remedial Action (UMTRA) Project Site is the initial document for developing site-specific activities to achieve regulatory compliance in the UMTRA Ground Water Project. The regulatory framework used to select the proposed ground water compliance strategies is presented along with a discussion of the relationship of this SOWP to other UMTRA Ground Water Project programmatic documents. The Shiprock site consists of two, interconnected hydrogeologic systems: the terrace system and the floodplain system. Separate compliance strategies are proposed for these two systems. The compliance strategy for the terrace aquifer is no remediation with the application of supplemental standards based on classification of the terrace aquifer as having Class III (limited-use) ground water. The compliance strategy for the floodplain aquifer is active remediation using a subsurface biological barrier. These strategies were selected by applying site-specific data to the compliance framework developed in the UMTRA Ground Water programmatic environmental impact statement (PEIS) (DOE, 1994a). The site conceptual model indicates that milling-related contamination has impacted the ground water in the terrace and

floodplain aquifers. Ground water occurs in both aquifers in alluvium and in fractures in the underlying Cretaceous age Mancos Shale. A mound of ground water related to fluids from the milling operations is thought to exist in the terrace aquifer below the area where settling ponds were in use during the mill operations. Most of the water occurring in the floodplain aquifer is from recharge from the San Juan River.

1808 (DOE/AL/62350-159) **Site observational work plan for the UMTRA Project site at Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 498p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003891. Source: OSTI; NTIS; INIS; GPO Dep.

The Ambrosia Lake Uranium Mill Tailings Remedial Action (UMTRA) Project site is within the Grants Mineral Belt and was one of numerous uranium mills supplied by many local mines. Ground water contamination at the site occurred as a result of uranium mill operations. The potential for impacts to human health and the environment from contaminated ground water currently does not exist. No domestic or livestock wells accessing ground water from the uppermost aquifer have been identified within a 5 mile radius from the site. Therefore, no current exposure pathways to humans, livestock, or wildlife exist, nor are any foreseen. The proposed ground water compliance strategy under consideration for application at the Ambrosia Lake site is to perform no remediation, based on the application of supplemental standards because the ground water has "limited use."

1809 (DOE/AL/62350-159/2/95) **Site Observational Work Plan for the UMTRA project site at Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1995. 498p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009461. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water compliance for the Uranium Mill Tailings Remedial Action (UMTRA) Project sites, including the Ambrosia Lake, New Mexico, site, is governed by the Uranium Mills Tailings Radiation Control Act (42 USC §7901 et seq.) and the U.S. Environmental Protection Agency's Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192; 60 FR 2854). The EPA standards describe specific conditions for which the U.S. Department of Energy (DOE) may apply for supplemental standards for contaminated ground water rather than meeting background levels or numerical standards. To achieve compliance with Subpart A of the EPA standards the residual radioactive materials are currently being consolidated on the site by the DOE in a disposal cell, isolating them from direct human or ecological contact and further dispersion into the environment. Completion of the disposal cell is scheduled for early 1995. An environmental assessment and a Finding of No Significant Impact (FONSI) were completed in 1987. Concurrence with the UMTRA Surface Project Ambrosia Lake remedial action plan (RAP) was granted by the U.S. Nuclear Regulatory Commission (NRC) and state of New Mexico in 1990. The DOE deferred compliance with Subpart B of the EPA standards in the Surface Project RAP. This site observational work plan (SOWP) is the first document to address ground water compliance under Subpart B at the Ambrosia Lake site. The Ambrosia Lake UMTRA Project site is within the Grants Mineral Belt and was one of numerous uranium mills supplied by many local mines. Ground water contamination at the site occurred as a result

of uranium mill operations. Contamination of ground water resulted from discharge of waste water, infiltration of water through the tailings pile, hydraulic placement of mill tailings in nearby mines, and water pumped from mine shafts.

1810 (DOE/AL/62350-160) Site observational work plan for the UMTRA Project site at Tuba City, Arizona. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001280. Source: OSTI; NTIS; INIS; GPO Dep.

The requirements for ground water compliance for Uranium Mill Tailings Remedial Action (UMTRA) Project sites, including the Tuba City, Arizona, site, are found in the Uranium Mill Tailings Radiation Control Act; Subparts B and C of the U.S. Environmental Protection Agency's Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192 (1994)), and the associated proposed 1987 standards (52 FR 36000). During the surface remedial action, an estimated 1,400,000 cubic yards (yd^3) (1,100,000 cubic meters [m^3]) of uranium mill tailings and other contaminated materials were consolidated and stabilized in place in an unlined disposal cell covering 50 acres (20 hectares). The surface remedial action was completed in April 1990. Ground water beneath the Tuba City site was contaminated by subsurface migration of water from uranium ore processing activities. The main source of contaminants was water from the tailings piles that began in 1956 when the mill opened and ended in 1966 when the mill closed. 800,000 tons (725,000 tonnes) of uranium ore were processed onsite over a 10-year period. The wet tailings remaining after processing were placed as a slurry in three piles at the site. Water from these tailings then seeped into the ground and migrated downward to the ground water. The Tuba City site is currently in a post-stabilization, prelicensing status. The site is expected to remain in this status until licensed by the U.S. Nuclear Regulatory Commission (NRC) for long-term surveillance and maintenance. The preliminary ground water compliance strategy at the Tuba City site is active remediation-specific technology to be evaluated is in situ bioremediation. This selection was made because of the potential ability of bioremediation to reduce concentrations to lower levels than a conventional extraction system and to minimize disturbance of the water resource.

1811 (DOE/AL/62350-161) Site observational work plan for the UMTRA Project Site at Tuba City, Arizona. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009833. Source: OSTI; NTIS; INIS; GPO Dep.

The requirements for ground water compliance for Uranium Mill Tailings Remedial Action (UMTRA) Project sites, including the Tuba City, Arizona, site, are found in the Uranium Mill Tailings Radiation Control Act; Subparts B and C of the U.S. Environmental Protection Agency's Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192 (1994)), and the associated proposed 1987 standards (52 FR 36000). During the surface remedial action, an estimated 1,400,000 cubic yards (yd^3) (1,100,000 cubic meters [m^3]) of uranium mill tailings and other contaminated materials were consolidated and stabilized in place in an unlined disposal cell covering 50 acres (20 hectares). The surface remedial action was completed in April 1990. Ground water beneath the Tuba City site was contaminated by subsurface migration of water from uranium ore processing activities. The main source of

contaminants was water from the tailings piles that began in 1956 when the mill opened and ended in 1966 when the mill closed. A total of 800,000 tons (725,000 tonnes) of uranium ore were processed onsite over a 10-year period. Two processes were used to refine the ore: an acid leach process and a sodium carbonate alkaline process. Water from these tailings then seeped into the ground and migrated downward to the ground water. The Tuba City site is currently in a post-stabilization, prelicensing status. The preliminary ground water compliance strategy at the Tuba City site is active remediation. The specific technology to be evaluated is in situ bioremediation. This selection was made because of the potential ability of bioremediation to reduce concentrations to lower levels than a conventional extraction system and to minimize disturbance of the water resource.

1812 (DOE/AL/62350-162) Site observational work plan for the UMTRA Project site at Riverton, Wyoming. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 288p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001271. Source: OSTI; NTIS; INIS; GPO Dep.

The site observational work plan (SOWP) for the Riverton, Wyoming, Uranium Mill Tailings Remedial Action (UMTRA) Project Site is the first document for the UMTRA Ground Water Project to address site-specific activities to meet compliance with the U.S. Environmental Protection Agency (EPA) proposed ground water standards (52 FR 36000 (1987)). In support of the activities the regulatory framework and drivers are presented along with a discussion of the relationship of this SOWP to other UMTRA Ground Water Project programmatic documents. A combination of the two compliance strategies that will be recommended for this site are no remediation with the application of alternate concentration levels (ACL) and natural flushing in conjunction with institutional controls. ACLs are to be applied to constituents that occur at concentrations above background levels but which are essential nutrients and occur within nutritional ranges and/or have very low toxicity and high dietary intake rates compared to the levels detected in the ground water. The essential premise of natural flushing is that ground water movement and natural attenuation processes will reduce the detected contamination to background levels within 100 years. These two recommended compliance strategies were evaluated by applying Riverton site-specific data to the compliance framework developed in the UMTRA Ground Water programmatic environmental impact statement. There are three aquifers beneath the site: a surficial unconfined aquifer, a middle semiconfined aquifer, and a deeper confined aquifer. The milling-related contamination at the site has affected both the surficial and semiconfined aquifers, although the leaky shale aquifers separating these units limits the downward migration of contamination into the semiconfined aquifer. A shale aquitard separates the semiconfined aquifer from the underlying confined aquifer which has not been contaminated by milling-related constituents.

1813 (DOE/AL/62350-162(Rev.3/95)) Site observational work plan for the UMTRA Project Site at Riverton, Wyoming. Revision 3/95. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1995. 287p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009891. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water compliance for the Uranium Mill Tailings Remedial Action (UMTRA) Project sites, including the Riverton, Wyoming, site, is governed by the Uranium Mill Tailings Radiation Control Act and the US Environmental Protection Agency's Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings. The compliance strategy proposed for this site is natural flushing in conjunction with institutional controls. The essential premise of natural flushing is that ground water movement and natural attenuation processes will reduce the detected contamination to background levels or alternate concentration limits that do not pose a risk to human health or the environment within 100 years. This document contains the following sections. Section 2.0 of this SOWP describes the requirements for meeting standards at UMTRA Project sites. Section 3.0 provides site-specific data and the related conceptual model. Section 4.0 provides the justification for the recommended ground water compliance strategy for the Riverton site. Section 5.0 provides the justification and process for collection and assessment of additional required data. Section 6.0 provides a list of the references cited. The appendixes include data on monitor wells and lithography, ground water, surface water, and sediment quality.

1814 (DOE/AL/62350-164) Work plan for monitor well/groundwater elevation data recorder installation at the Cheney Disposal site, Grand Junction, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001275. Source: OSTI; NTIS; INIS; GPO Dep.

In May 1990, during the excavation for the Grand Junction, Colorado, Cheney Reservoir disposal cell (Cheney), a water bearing paleochannel was encountered along the northern boundary of the excavation (designated the Northwest Paleochannel). To ensure the long-term integrity of the disposal embankment, remedial actions were taken including the excavation of the paleochannel and underlying material to bedrock, backfilling of the trapezoidal trench with granular material, and placement of a geotextile liner above the granular material. Compacted clay backfill was placed above the reconstructed paleochannel trench, and the northwest corner was restored to the designated grade. Investigation of other paleochannels determined that ground water flow terminated before it migrated as far west as the disposal cell. Therefore, flow in these paleochannels would have no impact on the disposal cell. Although characterization efforts did not indicate the presence of a ground water-bearing paleochannel south of the disposal cell, the potential could not be ruled out. As a best management practice for long-term monitoring at Cheney, two monitor wells will be installed within the paleochannels. One well will be installed within 50 feet (ft) west of the reconstructed Northwest Paleochannel. The second well will be installed near the southwestern (downgradient) corner of the disposal cell. The purposes of these wells are to characterize ground water flow (if any) within the paleochannels and to monitor the potential for water movement (seepage) into or out of the disposal cell. Initial monitoring of the paleochannels will consist of water level elevation measurement collection and trend analysis to evaluate fluctuations in storage. The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of two ground water monitor wells and two ground water elevation data recorders (data loggers) at Cheney.

1815 (DOE/AL/62350-165) Uranium mill tailings remedial action project real estate management plan. Department of Energy, Albuquerque, NM (United States). Albuquerque Operations Office. Sep 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001276. Source: OSTI; NTIS; INIS; GPO Dep.

This plan summarizes the real estate requirements of the US Department of Energy's (DOE) Uranium Mill Tailings Action (UMTRA) Project, identifies the roles and responsibilities of project participants involved in real estate activities, and describes the approaches used for completing these requirements. This document is intended to serve as a practical guide for all project participants. It is intended to be consistent with all formal agreements, but if a conflict is identified, the formal agreements will take precedence.

1816 (DOE/AL/62350-166) Status of the ground water flow model for the UMTRA Project, Shiprock, New Mexico, site. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007613. Source: OSTI; NTIS; INIS; GPO Dep.

A two-dimensional numerical model was constructed for the alluvial aquifer in the area of the Uranium Mill Tailings Remedial Action (UMTRA) Project Shiprock, New Mexico, site. This model was used to investigate the effects of various hydrologic parameters on the evolution of the ground water flow field. Results of the model are useful for defining uncertainties in the site conceptual model and suggesting data collection efforts to reduce these uncertainties. The computer code MODFLOW was used to simulate the two-dimensional flow of ground water in the alluvium. The escarpment was represented as a no-flow boundary. The San Juan River was represented with the MODFLOW river package. A uniform hydraulic conductivity distribution with the value estimated by the UMTRA Project Technical Assistance Contractor (TAC) and a uniform recharge distribution was used. Infiltration from the flowing artesian well was represented using the well package. The ground water flow model was calibrated to ground water levels observed in April 1993. Inspection of hydrographs shows that these levels are representative of typical conditions at the site.

1817 (DOE/AL/62350-167) Annual report on the U.S. Department of Energy's Cultural Resource Activities at Colorado UMTRA Project Sites for October 1993 through September 1994. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003912. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of cultural resource activities conducted by the U.S. Department of Energy (DOE) at Uranium Mill Tailings Remedial Action (UMTRA) Project sites in Colorado for the period of October 1, 1993, through September 30, 1994. The UMTRA Project is a cooperative (state and federal) program mandated by the Uranium Mill Tailings Radiation Control Act, Public Law 95-604 (42 USC §7901 et seq.). This law requires the timely cleanup of 24 inactive uranium mill tailings sites throughout the United States. Nine of these inactive uranium mill tailings sites are in Colorado at Durango, Grand Junction, Gunnison, Maybell, Naturita, Rifle, and Slick Rock. On December 6, 1984, the DOE, Advisory Council on Historic Preservation, and Colorado State Historic Preservation Officer (SHPO) entered

into a programmatic memorandum of agreement (PMOA) (DOE, 1984). This PMOA specifies requirements for the DOE's fulfillment of its obligations under various state and federal regulations for the protection and preservation of cultural resources. This report fulfills the requirement for the DOE to provide the state of Colorado with an annual report on the cultural resource activities performed for all of the UMTRA Project sites in Colorado. This report is organized by UMTRA Project site. For each site, the general remedial action activities and cultural resource activities performed during the period of record are summarized. When known, the DOE's plans for future cultural resource activities at the site are summarized.

1818 (DOE/AL/62350-168) Final report of the UMTRA Independent technical review of TAC audit programs. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003913. Source: OSTI; NTIS; INIS; GPO Dep.

This report details the findings of an Independent Technical Review (ITR) of practices and procedures for the Uranium Mill Tailings Remedial Action (UMTRA) Project audit program. The audit program is conducted by Jacobs Engineering Group Inc., the Technical Assistance Contractor (TAC) for the UMTRA Project. The purpose of the ITR was to ensure that the TAC audit program is effective and is conducted efficiently. The ITR was conducted from May 16-20, 1994. A review team observed audit practices in the field, reviewed the TAC audit program's documentation, and discussed the program with TAC staff and management. The format of this report has been developed around EPA guidelines; they comprise most of the major section headings. Each section begins by identifying the criteria that the TAC program is measured against, then describing the approach used by the ITR team to measure each TAC audit program against the criteria. An assessment of each type of audit is then summarized for each component in the following order: Radiological audit summary; Health and safety audit summary; Environmental audit summary; Quality assurance audit summary.

1819 (DOE/AL/62350-169-Rev.1) Proposed ground water protection strategy for the Uranium Mill Tailings Site at Green River, Utah. Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003914. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the US DOE water resources protection strategy for the Green River, Utah mill tailings disposal site. The modifications in the original plan are based on new information, including ground water quality data collected after remedial action was completed, and on a revised assessment of disposal cell design features, surface conditions, and site hydrogeology. All aspects are discussed in this report.

1820 (DOE/AL/62350-172) A review and assessment of variable density ground water flow effects on plume formation at UMTRA project sites. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009834. Source: OSTI; NTIS; INIS; GPO Dep.

A standard assumption when evaluating the migration of plumes in ground water is that the impacted ground water

has the same density as the native ground water. Thus density is assumed to be constant, and does not influence plume migration. This assumption is valid only for water with relatively low total dissolved solids (TDS) or a low difference in TDS between water introduced from milling processes and native ground water. Analyses in the literature suggest that relatively minor density differences can significantly affect plume migration. Density differences as small as 0.3 percent are known to cause noticeable effects on the plume migration path. The primary effect of density on plume migration is deeper migration than would be expected in the arid environments typically present at Uranium Mill Tailings Remedial Action (UMTRA) Project sites, where little or no natural recharge is available to drive the plume into the aquifer. It is also possible that at some UMTRA Project sites, a synergistic affect occurred during milling operations, where the mounding created by tailings drainage (which created a downward vertical gradient) and the density contrast between the process water and native ground water acted together, driving constituents deeper into the aquifer than either process would alone. Numerical experiments were performed with the U.S. Geological Survey saturated unsaturated transport (SUTRA) model. This is a finite-element model capable of simulating the effects of variable fluid density on ground water flow and solute transport. The simulated aquifer parameters generally are representative of the Shiprock, New Mexico, UMTRA Project site where some of the highest TDS water from processing has been observed.

1821 (DOE/AL/62350-174-Rev.1) Economic impact study of the Uranium Mill Tailings Remedial Action Project in Colorado: Colorado State fiscal year 1994. Revision 1. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007611. Source: OSTI; NTIS; INIS; GPO Dep.

The Colorado economic impact study summarizes employment and economic benefits to the state from activities associated with the Uranium Mill Tailings Remedial Action (UMTRA) Project during Colorado state fiscal year 1994 (1 July 1993 through 30 June 1994). To capture employment information, a questionnaire was distributed to subcontractor employees at the active UMTRA Project sites of Grand Junction, Naturita, Gunnison, and Rifle, Colorado. Economic data were requested from each site prime subcontractor, as well as from the Remedial Action Contractor. Information on wages, taxes, and subcontract expenditures in combination with estimates and economic multipliers is used to estimate the dollar economic benefits to Colorado during the state fiscal year. Finally, the fiscal year 1994 estimates are compared to fiscal year 1993 employment and economic information.

1822 (DOE/AL/62350-175) Baseline risk assessment of ground water contamination at the uranium mill tailings site near Durango, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1995. 237p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007609. Source: OSTI; NTIS; INIS; GPO Dep.

This risk assessment evaluates the possibility of health and environmental risks from contaminated ground water at the uranium mill tailings site near Durango, Colorado. The former uranium processing site's contaminated soil and material were removed and placed at a disposal site located in

Body Canyon, Colorado, during 1986–1991 by the US Departments of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project. Currently, the UMTRA Project is evaluating the nature and extent of ground water contamination at the site. This risk assessment follows an approach similar to that used by the US Environmental Protection Agency. The first step is to determine what site-related contaminants are found in ground water samples. The next step in the risk assessment is to determine how much of these contaminants people might ingest if they got their drinking water from a well on the site. In accordance with standard practice for this type of risk assessment, the highest contaminant concentrations from the most contaminated wells are used. The risk assessment then explains the possible health problems that could result from this amount of contamination.

1823 (DOE/AL/62350–176) Slope and bank erosional stability of the Canonsburg, Pennsylvania, UMTRA disposal site. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007612. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared in response to US Nuclear Regulatory Commission (NRC) comments received in a letter of 8 March 1994. This letter included discussions of the US Department of Energy (DOE) 21 May 1993 geomorphic report for the Canonsburg, Pennsylvania, site. To clarify the NRC's position, a DOE/NRC conference call was held on 12 April 1994. The NRC clarified that it did not require a preliminary erosion protection design for the Canonsburg site, but directed the DOE to address a "one-bad-year" scenario. The NRC wants confirmation that one bad year of stream flooding and landsliding will not release residual radioactive material (RRM) from the Canonsburg site into the creek. The NRC is concerned that a bad year theoretically could occur between post-closure inspections. These annual inspections are conducted in September or October. The NRC suggested that the following procedures should be conducted in this analysis: a flooding analysis, including the maximum saturation levels (flood water elevations) anticipated during a 100-year flood; a stream bank erosion analysis to determine how much of the bank adjacent to the site may be removed in a bad year; a slope stability analysis to determine how far back the site would be disturbed by slope instability that could be triggered by a bad year of stream bank erosion; and a "critical cross section" study to show the relationship of the RRM located outside the disposal cell to the maximum computer estimated erosion/landslide activity.

1824 (DOE/AL/62350–181) UMTRA Project: Environment, Safety, and Health Plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1995. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95007607. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has prepared this UMTRA Project Environment, Safety, and Health (ES and H) Plan to establish the policy, implementing requirements, and guidance for the UMTRA Project. The requirements and guidance identified in this plan are designed to provide technical direction to UMTRA Project contractors to assist in the development and implementation of their ES and H plans and programs for UMTRA Project work activities. Specific requirements set forth in this UMTRA Project ES and H Plan are intended to provide uniformity to the UMTRA Project's

ES and H programs for processing sites, disposal sites, and vicinity properties. In all cases, this UMTRA Project ES and H Plan is intended to be consistent with applicable standards and regulations and to provide guidance that is generic in nature and will allow for contractors' evaluation of site or contract-specific ES and H conditions. This plan specifies the basic ES and H requirements applicable to UMTRA Project ES and H programs and delineates responsibilities for carrying out this plan. DOE and contractor ES and H personnel are expected to exercise professional judgment and apply a graded approach when interpreting these guidelines, based on the risk of operations.

1825 (DOE/AL/62350–T1) Evaluation of impacts and mitigation assessments for the UMTRA Project: Gunnison and Durango pilot studies: Final report. Beranich, S.J. (Southwest Environmental, Albuquerque, NM (United States)). Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Southwest Environmental, Albuquerque, NM (United States). 24 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018487. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the impacts assessment and proposed mitigations provided in environmental documents concerning the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. The projected impacts and proposed mitigations identified in UMTRA Project environmental documents were evaluated for two UMTRA Project sites. These sites are Gunnison and Durango, which are representative of currently active and inactive UMTRA Project sites, respectively. National Environmental Policy Act (NEPA) documentation was prepared for the remedial action at Durango and Gunnison as well as for the provision of an alternate water supply system at Gunnison. Additionally, environmental analysis was completed for mill site demolition Gunnison, and for a new road related to the Durango remedial action. The results in this report pertain only to the impact assessments prepared by the Regulatory Compliance staff as a part of the NEPA compliance requirements. Similarly, the mitigative measures documented are those that were identified during the NEPA process.

1826 (DOE/AL/62350–T2) Finding of no significant impact proposed remedial action at two uranium processing sites near Slick Rock, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001260. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has prepared an environmental assessment (EA) (DOE/EA-0339) of the proposed remedial action at two uranium processing sites near Slick Rock in San Miguel County, Colorado. These sites contain radioactively contaminated materials that would be removed and stabilized at a remote location. Based on the information and analyses in the EA, the DOE has determined that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.), as amended. Therefore, preparation of an environmental impact statement is not required, and the DOE is issuing this Finding of No Significant Impact (ONSI).

1827 (DOE/AL/62350-T3) Modifications to the remedial action plan and site design for stabilization of the Inactive Uranium Mill Tailings Site at Green River, Utah. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001262. Source: OSTI; NTIS; INIS; GPO Dep.

Modifications to the water resources protection strategy detailed in the remedial action plan for the Green River, Utah, disposal site are presented. The modifications are based on new information, including ground water quality data collected after remedial action was completed and on a revised assessment of disposal cell design features, surface conditions, and site hydrogeology. The modifications will result in compliance with the U.S. EPA proposed ground water standards (52 FR 36000 (1987)).

1828 (DOE/AL/62350-T4) UMTRA Project Administrative Files Collection Records Management Program. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003924. Source: OSTI; NTIS; INIS; GPO Dep.

The UPAFC Records Management Plan is based on the life cycle of a record - the evolution of a record from creation until final disposition. There are three major phases in the life cycle of a record: (1) creation and receipt, (2) maintenance and use, and (3) disposition. Accordingly, the Records Management Plan is structured to follow each of those phases. During each of the three phases, some kind of control is mandatory. The Records Management Plan establishes appropriate standards, policies, and procedures to ensure adequate control is always maintained. It includes a plan for records management, a plan for records management training activities, and a plan for auditing and appraising the program.

1829 (DOE/AL/62350-T5) Finding of No Significant Impact, proposed remediation of the Maybell Uranium Mill Processing Site, Maybell, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003925. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has prepared an environmental assessment (EA) (DOE/EA-0347) on the proposed surface remediation of the Maybell uranium mill processing site in Moffat County, Colorado. The mill site contains radioactively contaminated materials from processing uranium ore that would be stabilized in place at the existing tailings pile location. Based on the analysis in the EA, DOE has determined that the proposed action does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190 (42 U.S.C. §4321 et seq.), as amended. Therefore, preparation of an environmental impact statement is not required and DOE is issuing this Finding of No Significant Impact (FONSI).

1830 (DOE/AL/62350-T6) Comment and response document for the long-term surveillance plan and the completion report for the Lowman, Idaho, disposal site. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003926. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains comments, maps, ground water monitoring data, deeding information for remedial action on mill tailings at the Lowman, Idaho UMTRA site.

1831 (DOE/EA-0339) Environmental assessment of remedial action at the Slick Rock uranium mill tailings sites, Slick Rock, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1995. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95008022. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Radiation Control Act of 1978, hereafter referred to as the UMTRCA, authorized the US Department of Energy (DOE) to clean up two uranium mill tailings processing sites near Slick Rock, Colorado, in San Miguel County. The purpose of the cleanup is to reduce the potential health effects associated with the radioactive materials remaining on the processing sites and on vicinity properties (VPs) associated with the sites. The US Environmental Protection Agency (EPA) promulgated standards for the UMTRCA that contained measures to control the contaminated materials and to protect the ground water from further degradation. The sites contain concrete foundations of mill buildings, tailings piles, and areas contaminated by windblown and waterborne radioactive tailings materials. The proposed action is to remediate the UC and NC sites by removing all contaminated materials within the designated site boundaries or otherwise associated with the sites, and relocating them to, and stabilizing them at, a location approximately 5 road mi (8 km) northeast of the processing sites on land administered by the US Bureau of Land Management (BLM). Remediation would be performed by the DOE's Uranium Mill Tailings Remedial Action (UMTRA) Project.

1832 (DOE/EA-0339-Rev.2) Environmental assessment of remedial action at the slick rock Uranium Mill Tailings sites Slick Rock, Colorado. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 157p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95001279. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Radiation Control Act of 1978 (42 USC § 7901 et seq.), hereafter referred to as the UMTRCA, authorized the U.S. Department of Energy (DOE) to clean up two uranium mill tailings processing sites near Slick Rock, Colorado, in San Miguel County. The purpose of the cleanup is to reduce the potential health effects associated with the radioactive materials remaining on the sites and on vicinity properties (VPs) associated with the sites. Contaminated materials cover an estimated 55 acres of the Union Carbide (UC) processing site and 12 ac of the North Continent (NC) processing site. The total estimated volume of contaminated materials is approximately 61 8,300 cubic yards. In addition to the contamination in the two processing site areas, four VPs were found to contain contamination. As a result of the tailings being exposed to the environment, contamination associated with the UC and NC sites has leached into shallow ground water. Surface water has not been affected. The closest residence is approximately 0.3 air mi from either site. The proposed action is to remediate the UC and NC sites by removing all contaminated materials within the designated site boundaries or otherwise associated with the sites, and relocating them to, and stabilizing them at, a location approximately 5 road mi (8 km) northeast of the sites on land administered by the Bureau of Land Management (BLM). Remediation would be performed by the DOE's Uranium Mill Tailings Remedial Action (UMTRA)

Project. All solid contaminated materials would be buried under 5 feet (ft) of rock and soil materials. The proposed disposal site area is currently used by ranchers for cattle grazing over a 7-month period. The closest residence to the proposed disposal site is 2 air mi. An estimated 44 ac of land would be permanently transferred from the BLM to the DOE and restricted from future use.

1833 (DOE/EA-0347-Rev.2) Environmental assessment of remedial action at the Maybell uranium mill tailings site near Maybell, Colorado: Revision 2. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1994. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003887. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this environmental assessment (EA) is to evaluate the environmental impacts resulting from remedial action at the Maybell uranium mill tailings site near Maybell, Colorado. A biological assessment and a floodplain/wetlands assessment are included as part of this EA. This report and attachments describe the proposed action, affected environment, and environmental impacts associated with the proposed remedial action, including impacts to threatened and endangered species listed or proposed for listing by the US Fish and Wildlife Service (FWS).

1834 (DOE/EA-0464-Rev.4) Environmental assessment of remedial action at the Naturita Uranium Processing Site near Naturita, Colorado: Revision 4. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1994. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94014398. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, Public Law (PL) 95-604, authorized the US Department of Energy (DOE) to perform remedial action at the Naturita, Colorado, uranium processing site to reduce the potential health effects from the radioactive materials at the site and at vicinity properties associated with the site. The US Environmental Protection Agency (EPA) promulgated standards for the UMTRCA that contain measures to control the contaminated materials and to protect groundwater quality. Remedial action at the Naturita site must be performed in accordance with these standards and with the concurrence of the US Nuclear Regulatory Commission (NRC) and the state of Colorado. The proposed remedial action for the Naturita processing site is relocation of the contaminated materials and debris to either the Dry Flats disposal site, 6 road miles (mi) [10 kilometers (km)] to the southeast, or a licensed non-DOE disposal facility capable of handling RRM. At either disposal site, the contaminated materials would be stabilized and covered with layers of earth and rock. The proposed Dry Flats disposal site is on land administered by the Bureau of Land Management (BLM) and used primarily for livestock grazing. The final disposal site would cover approximately 57 ac (23 ha), which would be permanently transferred from the BLM to the DOE and restricted from future uses. The remedial action would be conducted by the DOE's Uranium Mill Tailings Remedial Action (UMTRA) Project. This report discusses environmental impacts associated with the proposed remedial action.

1835 (DOE/EA-0464-Rev.5) Environmental assessment of remedial action at the Naturita uranium processing site near Naturita, Colorado: Revision 5. Jacobs Engineering Group, Inc., Albuquerque, NM (United

States). Oct 1994. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95003888. Source: OSTI; NTIS; INIS; GPO Dep.

Title 1 of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, Public Law (PL) 95-604, authorized the US Department of Energy (DOE) to perform remedial action at the inactive Naturita, Colorado, uranium processing site to reduce the potential health effects from the radioactive materials at the site and at vicinity properties associated with the site. Title 2 of the UMTRCA authorized the US Nuclear Regulatory Commission (NRC) or agreement state to regulate the operation and eventual reclamation of active uranium processing sites. The uranium mill tailings at the site were removed and reprocessed from 1977 to 1979. The contaminated areas include the former tailings area, the mill yard, the former ore storage area, and adjacent areas that were contaminated by uranium processing activities and wind and water erosion. The Naturita remedial action would result in the loss of 133 acres (ac) of contaminated soils at the processing site. If supplemental standards are approved by the NRC and the state of Colorado, approximately 112 ac of steeply sloped contaminated soils adjacent to the processing site would not be cleaned up. Cleanup of this contamination would have adverse environmental consequences and would be potentially hazardous to remedial action workers.

1836 (DOE/MC/30170-95/C0438) Advanced technologies for decontamination and conversion of scrap metals. Muth, T.R. (Manufacturing Sciences Corp., Oak Ridge, TN (United States)); Moore, J.; Olson, D.; Mishra, B. Manufacturing Sciences Corp., Oak Ridge, TN (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30170. (CONF-9411149-25: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95008947. Source: OSTI; NTIS; INIS; GPO Dep.

Recycle of radioactive scrap metals (RSM) from decommissioning of DOE uranium enrichment and nuclear weapons manufacturing facilities is mandatory to recapture the value of these metals and avoid the high cost of disposal by burial. The scrap metals conversion project detailed below focuses on the contaminated nickel associated with the gaseous diffusion plants. Stainless steel can be produced in MSC's vacuum induction melting process (VIM) to the S30400 specification using nickel as an alloy constituent. Further the case alloy can be rolled in MSC's rolling mill to the mechanical property specification for S30400 demonstrating the capability to manufacture the contaminated nickel into valuable end products at a facility licensed to handle radioactive materials. Bulk removal of Technetium from scrap nickel is theoretically possible in a reasonable length of time with the high calcium fluoride flux, however the need for the high temperature creates a practical problem due to flux volatility. Bulk decontamination is possible and perhaps more desirable if nickel is alloyed with copper to lower the melting point of the alloy allowing the use of the high calcium fluoride flux. Slag decontamination processes have been suggested which have been proven technically viable at the Colorado School of Mines.

1837 (DOE/OR-01-1109) Environmental Restoration Program project management plan for the DOE Oak Ridge Field Office Major System Acquisition OR-1: Revision 1, Environmental Restoration Program. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United

States); Martin Marietta Energy Systems, Inc., Piketon, OH (United States). Dec 1992. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (ORNL/M-2553). Order Number DE94009204. Source: OSTI; NTIS; GPO Dep.

In the early 1940s, the Manhattan Project was conducted in a regulatory and operational environment less sophisticated than today. Less was known of the measures needed to protect human health and safety and the environment from the dangers posed by radioactive and hazardous wastes, and experience in dealing with these hazardous materials has grown slowly. Certain hazards were recognized and dealt with from the beginning. However, the techniques used, though standard practices at the time, are now known to have been inadequate. Consequently, the DOE has committed to an aggressive program for cleaning up the environment and has initiated an Environmental Restoration Program involving all its field offices. The objective of this program is to ensure that inactive and surplus DOE facilities and sites meet current standards to protect human health and the environment. The objective of these activities is to ensure that risks posed to human health and safety and the environment by inactive sites and surplus facilities contaminated with radioactive, hazardous, and/or mixed wastes are either eliminated or reduced to prescribed safe levels. This Project Management Plan for Major System Acquisition OR-1 Project documents, communicates, and contributes to the evolution of, the management organizations, systems, and tools necessary to carry out effectively the long-range complex cleanup of the DOE sites on the Oak Ridge Reservation, and at the Paducah, Kentucky, and Piketon, Ohio, uranium enrichment plants managed by the Department of Energy Oak Ridge Field Office; the cleanup of off-site contamination resulting from past releases; and the Decontamination and Decommissioning of surplus DOE facilities at these installations.

1838 (DOE/OR-01-1313-D1) Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste collection and transfer system upgrade for Building 3092 (central off-gas scrubber facility) at Oak Ridge National Laboratory. Gilbert/Commonwealth, Inc., Reading, PA (United States). Oct 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-274-D1). Order Number DE95002302. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes and assesses planned modifications to be made to the Building 3092 Central Off-Gas Scrubber Facility of the Oak Ridge National Laboratory, Oak Ridge, Tennessee. The modifications are made in response to the requirements of 40CFR264 Subpart J, relating to environmental protection requirements for buried tank systems. The modifications include the provision of a new scrubber recirculation tank in a new, below ground, lined concrete vault, replacing an existing recirculation sump that does not provide double containment. A new buried, double contained pipeline is provided to permit discharge of spent scrubber recirculation fluid to the Central Waste Collection Header. The new vault, tank, and discharge line are provided with leak detection and provisions to remove accumulated liquid. Ne scrubber recirculation pumps, piping, and accessories are also provided. This assessment concludes that the planned modifications comply with applicable requirements of 40CFR264 Subpart J, as set forth in Appendix F to the Federal Facility Agreement, Docket No. 89-04-FF, covering the Oak Ridge Reservation. A formal design

certification statement is included herein on Page 53, a certification covering the installation shall be executed prior to placing the modified facility into service.

1839 (DOE/RL-92-61-Rev.2) Tank waste remediation system integrated technology plan. Revision 2. Eaton, B. (Pacific Northwest Lab., Richland, WA (United States)); Ignatov, A.; Johnson, S.; Mann, M.; Morasch, L.; Ortiz, S.; Novak, P. (eds.). USDOE Richland Operations Office, WA (United States). Technology Development Program Office of the TWRS Program; Pacific Northwest Lab., Richland, WA (United States). 28 Feb 1995. 541p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL-10092-Rev.2). Order Number DE95008203. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site, located in southeastern Washington State, is operated by the US Department of Energy (DOE) and its contractors. Starting in 1943, Hanford supported fabrication of reactor fuel elements, operation of production reactors, processing of irradiated fuel to separate and extract plutonium and uranium, and preparation of plutonium metal. Processes used to recover plutonium and uranium from irradiated fuel and to recover radionuclides from tank waste, plus miscellaneous sources resulted in the legacy of approximately 227,000 m³ (60 million gallons) of high-level radioactive waste, currently in storage. This waste is currently stored in 177 large underground storage tanks, 28 of which have two steel walls and are called double-shell tanks (DSTs) an 149 of which are called single-shell tanks (SSTs). Much of the high-heat-emitting nuclides (strontium-90 and cesium-137) has been extracted from the tank waste, converted to solid, and placed in capsules, most of which are stored onsite in water-filled basins. DOE established the Tank Waste Remediation System (TWRS) program in 1991. The TWRS program mission is to store, treat, immobilize and dispose, or prepare for disposal, the Hanford tank waste in an environmentally sound, safe, and cost-effective manner. Technology will need to be developed or improved to meet the TWRS program mission. The Integrated Technology Plan (ITP) is the high-level consensus plan that documents all TWRS technology activities for the life of the program.

1840 (DOE/WIPP-94-1020) WIPP facility representative program plan. USDOE Albuquerque Operations Office, NM (United States). Waste Isolation Pilot Plant Project Office. 15 Jul 1994. 34p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002832. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the Department of Energy (DOE), Carlsbad Area Office (CAO) facility representative (FR) program at the Waste Isolation Pilot Plant (WIPP). It provides the following information: (1) FR and support organization authorities and responsibilities; (2) FR program requirements; and (3) FR training and qualification requirements.

1841 (EGG-M-94179) Developments in radiography and tomography of waste containers at the Idaho National Engineering Laboratory. Roney, T.J.; Allemeier, R.T.; Galbraith, S.G.; Tow, D.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940815-108: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005037. Source: OSTI; NTIS; INIS; GPO Dep.

oThe Idaho National Engineering Laboratory (INEL) has been inspecting containers (boxes and drums) of nuclear

waste materials using real-time radiography (RTR) for the past ten years. Requirements governing characterization of containerized waste for short-term storage, treatment, transportation, and disposal have become more stringent. These new requirements, and the need to reduce inspection times to increase throughput, necessitate improvements in the information obtained by radiographic methods. RTR provides a qualitative view of container contents, whereas quantitative information is often required. Two projects at the INEL are converting the present qualitative radiographic inspection to the more quantitative digital radiography (DR) and computed tomography (CT) methods, while retaining the RTR function. The first project is modifying the RTR hardware at the Radioactive Waste Management Complex (RWMC) to allow rapid processing of analog RTR images. The digital RTR (DRTR) system described here can digitize, process, and redisplay RTR images at video frame rates allowing for real-time image improvement features such as edge detection, contrast enhancement, frame subtraction, frame averaging, and a variety of digital filtering options. The second project is developing a complete radiographic and tomographic capability that allows for greater sophistication in data acquisition and processing as the operator and/or requirements demand. The approach involves modification of an industrial CT scanner with the capability to acquire radiographic and tomographic data in several modes, including conventional RTR, DR, and CT with a linear detector for high spatial resolution, and DR and CT with an area detector for high throughput. Improvements in image quality and quantitative digital radiographic capabilities of the DRTR system are shown. Status and plans for the modified CT scanner (presently under development) are also presented.

1842 (EGG-M-94234) Buried Waste Integrated Demonstration lessons learned: 1993 technology demonstrations. Kostelnik, K.M.; Owens, K.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940815-107: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005018. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated technology demonstration was conducted by the Buried Waste Integrated Demonstration (BWID) at the Idaho National Engineering Laboratory Cold Test Pit in the summer of 1993. This program and demonstration was sponsored by the US Department of Energy Office of Technology Development. The demonstration included six technologies representing a synergistic system for the characterization and retrieval of a buried hazardous waste site. The integrated technology demonstration proved very successful and a summary of the technical accomplishments is presented. Upon completion of the integrated technology demonstration, cognizant program personnel participated in a lessons learned exercise. This exercise was conducted at the Simplot Decision Support Center at Idaho State University and lessons learned activity captured additional information relative to the integration of technologies for demonstration purposes. This information will be used by BWID to enhance program planning and strengthen future technology demonstrations.

1843 (EGG-WROC-11152) Hazards assessment for the INEL Landfill Complex. Knudsen, J.K.; Calley, M.B. EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1994. 21p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC07-76ID01570. Order Number DE94015255. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the hazards assessment for the INEL Landfill Complex (LC) located at the Idaho National Engineering Laboratory, which is operated by EG&G Idaho, Inc., for the US Department of Energy (DOE). The hazards assessment was performed to ensure that this facility complies with DOE and company requirements pertaining to emergency planning and preparedness for operational emergencies. DOE Order 5500.3A requires that a facility-specific hazards assessment be performed to provide the technical basis for facility emergency planning efforts. This hazards assessment was conducted in accordance with DOE Headquarters and the DOE Idaho Operations Office (DOE-ID) guidance to comply with DOE Order 5500.3A. The hazards assessment identifies and analyzes the hazards that are significant enough to warrant consideration in a facility's operational emergency management program. The area surrounding the LC, the buildings and structures at the LC, and the processes that are used at the LC are described in this report. All hazardous materials, both radiological and nonradiological, at the LC were identified and screened against threshold quantities according to DOE Order 5500.3A guidance. Asbestos at the Asbestos Pit was the only hazardous material that exceeded its specified threshold quantity. However, the type of asbestos received and the packaging practices used are believed to limit the potential for an airborne release of asbestos fibers. Therefore, in accordance with DOE Order 5500.3A guidance, no further hazardous material characterization or analysis was required for this hazards assessment.

1844 (EGG-WTD-10942) Off-gassing induced tracer release from molten basalt pools. Cronenberg, A.W. (Engineering Science and Analysis, Albuquerque, NM (United States)); Callow, R.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94010713. Source: OSTI; NTIS; INIS; GPO Dep.

Two in situ vitrification (ISV) field tests were conducted at the Idaho National Engineering Laboratory (INEL) during the summer of 1990 to assess ISV suitability for long-term stabilization of buried waste that contains transuranic and other radionuclide contaminants. The ISV process uses electrical resistance heating to melt buried waste and soil in place, which upon cooldown and resolidification fixes the waste into a vitrified (glass-like) form. In these two ISV field tests, small quantities of rare-earth oxides (tracers DY_2O_3 , Yb_2O_3 , and Tb_4O_7) were placed in the test pits to simulate the presence of plutonium oxides and assess plutonium retention/release behavior. The analysis presented in this report indicates that dissolution of tracer oxides into basaltic melts can be expected with subsequent tracer molecular or microparticle carry-off by escaping gas bubbles, which is similar to adsorptive bubble separation and ion flotation processes employed in the chemical industry to separate dilute heavy species from liquids under gas sparging conditions. Gaseous bubble escape from the melt surface and associated aerosolization is believed to be responsible for small quantities of tracer ejection from the melt surface to the cover hood and off-gas collection system. Methods of controlling off-gassing during ISV would be expected to improve the overall retention of such heavy oxide contaminants during melting/vitrification of buried waste.

1845 (EGG-WTD-10981-Vol.1) Baseline tests for arc melter vitrification of INEL buried wastes: Volume 1: Facility description and summary data report. Oden, L.L.; O'Connor, W.K.; Turner, P.C.; Soelberg, N.R.; Anderson, G.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 19 Nov 1993. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002027. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents field results and raw data from the Buried Waste Integrated Demonstration (BWID) Arc Melter Vitrification Project Phase 1 baseline test series conducted by the Idaho National Engineering Laboratory (INEL) in cooperation with the U.S. Bureau of Mines (USBM). The baseline test series was conducted using the electric arc melter facility at the USBM Albany Research Center in Albany, Oregon. Five different surrogate waste feed mixtures were tested that simulated thermally-oxidized, buried, TRU-contaminated, mixed wastes and soils present at the INEL. The USBM Arc Furnace Integrated Waste Processing Test Facility includes a continuous feed system, the arc melting furnace, an offgas control system, and utilities. The melter is a sealed, 3-phase alternating current (ac) furnace approximately 2 m high and 1.3 m wide. The furnace has a capacity of 1 metric ton of steel and can process as much as 1,500 lb/h of soil-type waste materials. The surrogate feed materials included five mixtures designed to simulate incinerated TRU-contaminated buried waste materials mixed with INEL soil. Process samples, melter system operations data and offgas composition data were obtained during the baseline tests to evaluate the melter performance and meet test objectives. Samples and data gathered during this program included (a) automatically and manually logged melter systems operations data, (b) process samples of slag, metal and fume solids, and (c) offgas composition, temperature, velocity, flowrate, moisture content, particulate loading and metals content. This report consists of 2 volumes: Volume I summarizes the baseline test operations. It includes an executive summary, system and facility description, review of the surrogate waste mixtures, and a description of the baseline test activities, measurements, and sample collection. Volume II contains the raw test data and sample analyses from samples collected during the baseline tests.

1846 (EGG-WTD-10981-Vol.2) Baseline tests for arc melter vitrification of INEL buried wastes: Volume II: Baseline test data appendices. Oden, L.L.; O'Connor, W.K.; Turner, P.C.; Soelberg, N.R.; Anderson, G.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 19 Nov 1993. 488p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002028. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents field results and raw data from the Buried Waste Integrated Demonstration (BWID) Arc Melter Vitrification Project Phase 1 baseline test series conducted by the Idaho National Engineering Laboratory (INEL) in cooperation with the U.S. Bureau of Mines (USBM). The baseline test series was conducted using the electric arc melter facility at the USBM Albany Research Center in Albany, Oregon. Five different surrogate waste feed mixtures were tested that simulated thermally-oxidized, buried, TRU-contaminated, mixed wastes and soils present at the INEL. The USBM Arc Furnace Integrated Waste Processing Test Facility includes a continuous feed system, the arc melting furnace, an offgas control system, and utilities. The melter is a sealed, 3-phase alternating current (ac) furnace approximately 2 m high and 1.3 m wide. The furnace has a capacity

of 1 metric ton of steel and can process as much as 1,500 lb/h of soil-type waste materials. The surrogate feed materials included five mixtures designed to simulate incinerated TRU-contaminated buried waste materials mixed with INEL soil. Process samples, melter system operations data and offgas composition data were obtained during the baseline tests to evaluate the melter performance and meet test objectives. Samples and data gathered during this program included (a) automatically and manually logged melter systems operations data, (b) process samples of slag, metal and fume solids, and (c) offgas composition, temperature, velocity, flowrate, moisture content, particulate loading and metals content. This report consists of 2 volumes: Volume I summarizes the baseline test operations. It includes an executive summary, system and facility description, review of the surrogate waste mixtures, and a description of the baseline test activities, measurements, and sample collection. Volume II contains the raw test data and sample analyses from samples collected during the baseline tests.

1847 (EGG-WTD-11138) Arc melter demonstration baseline test results. Soelberg, N.R.; Chambers, A.G.; Anderson, G.L.; Oden, L.L.; O'Connor, W.K.; Turner, P.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 321p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001977. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the test results and evaluation for the Phase 1 (baseline) arc melter vitrification test series conducted for the Buried Waste Integrated Demonstration program (BWID). Phase 1 tests were conducted on surrogate mixtures of as-incinerated wastes and soil. Some buried wastes, soils, and stored wastes at the INEL and other DOE sites, are contaminated with transuranic (TRU) radionuclides and hazardous organics and metals. The high temperature environment in an electric arc furnace may be used to process these wastes to produce materials suitable for final disposal. An electric arc furnace system can treat heterogeneous wastes and contaminated soils by (a) dissolving and retaining TRU elements and selected toxic metals as oxides in the slag phase, (b) destroying organic materials by dissociation, pyrolyzation, and combustion, and (c) capturing separated volatilized metals in the offgas system for further treatment. Structural metals in the waste may be melted and tapped separately for recycle or disposal, or these metals may be oxidized and dissolved into the slag. The molten slag, after cooling, will provide a glass/ceramic final waste form that is homogeneous, highly nonleachable, and extremely durable. These features make this waste form suitable for immobilization of TRU radionuclides and toxic metals for geologic timeframes. Further, the volume of contaminated wastes and soils will be substantially reduced in the process.

1848 (EGG-WTD-11185) Test plan for the remote conveyance and innovative end effector demonstration. Rice, P. (EG&G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab.); Smith, A.M.; Peterson, R. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001390. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the demonstration of innovative equipment and processes specifically designed to be superior to currently employed technology for buried waste retrieval. The dumping of dry soil into a funnel/dumpster arrangement has been found to be the primary mechanism for

dust generation during the retrieval of buried transuranic waste. The primary goal of the innovative end effector is to reduce dust generation and the potential spread of airborne contaminants during the dumping operation. In addition, regardless of the excavation technique, exhumed waste will have to be conveyed away from the retrieval area to a packaging area or directly to a treatment facility. The remote conveyance system is aimed at developing a remotely controlled vehicle to convey retrieved waste that will operate on variable terrain and remove workers from the hazardous zone. To demonstrate the remote conveyance system and the innovative end effector, the Buried Waste Integrated Demonstration (BWID) Program has subcontracted with RAHCO International to provide equipment and services to perform a demonstration of the technologies. The demonstration will be performed in two phases. In Phase I, the subcontractor will perform a full scale demonstration to assess the ability of the innovative end effector to control dust generation and the potential spread of contamination during dumping operations. Phase II includes performing a retrieval/conveyance demonstration. This demonstration will excavate, dump, and convey simulated waste to demonstrate the functionality of the system (e.g., maneuverability, retrieval rates, and system integration). Phase II of the demonstration will include all elements of the remote conveyance and end effector system. This test plan will describe the demonstration objectives, data quality objectives, equipment operation, and methods for collecting data during the demonstration.

1849 (EGG-WTD-11191) Buried Waste Integrated Demonstration stakeholder involvement model. Kaugpanger, R.M.; Kostelnik, K.M.; Milam, L.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015384. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) is a program funded by the US Department of Energy (DOE) Office of Technology Development. BWID supports the applied research, development, demonstration, and evaluation of a suite of advanced technologies that together form a comprehensive remediation system for the effective and efficient remediation of buried waste. Stakeholder participation in the DOE Environmental Management decision-making process is critical to remediation efforts. Appropriate mechanisms for communication with the public, private sector, regulators, elected officials, and others are being aggressively pursued by BWID to permit informed participation. This document summarizes public outreach efforts during FY-93 and presents a strategy for expanded stakeholder involvement during FY-94.

1850 (EGG-WTD-11208) Test plan for preparing the Rapid Transuranic Monitoring Laboratory for field deployment. McIsaac, C.V.; Sill, C.W.; Gehrke, R.J.; Killian, E.W.; Watts, K.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015289. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes experimental work that will be performed during fiscal year 1994 to prepare the Rapid Transuranic Monitoring Laboratory (RTML) for routine field use by US Department of Energy (DOE) Environmental Restoration and Waste Management programs. The RTML is a mobile, field-deployable laboratory developed at the Idaho National Engineering Laboratory (INEL) that provides

a rapid, cost-effective means of characterizing and monitoring radioactive waste remediation sites for low-level radioactive contaminants. Analytical instruments currently installed in the RTML include an extended-range, germanium photon analysis spectrometer with an automatic sample changer; two, large-area, ionization chamber alpha spectrometers; and four alpha continuous air monitors. The RTML was field tested at the INEL during June 1993 in conjunction with the Buried Waste Integrated Demonstration's remote retrieval demonstration. The major tasks described in this test plan are to (a) evaluate the beta detectors for use in screening soil samples for ^{90}Sr , (b) upgrade the alpha spectral analysis software programs, and (c) upgrade the photon spectral analysis software programs.

1851 (EGG-WTD-11424) Test plan for FY-94 digface characterization field experiments. Josten, N.E.; Roybal, L.G. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002008. Source: OSTI; NTIS; INIS; GPO Dep.

The digface characterization concept has been under development at the Idaho National Engineering Laboratory (INEL) since fiscal year (FY) 1992 through the support of the Buried Waste Integrated Demonstration Program. A digface characterization system conducts continuous subsurface characterization simultaneously with retrieval of hazardous and radioactive waste from buried waste sites. The system deploys multiple sensors at the retrieval operation digface and collects data that provide a basis for detecting, locating, and classifying buried materials and hazardous conditions before they are disturbed by the retrieval equipment. This test plan describes ongoing efforts to test the digface characterization concept at the INEL's Cold Test Pit using a simplified prototype deployment apparatus and off-the-shelf sensors. FY-94 field experiments will explore problems in object detection and classification. Detection and classification of objects are fundamental to three of the four primary functions of digface characterization during overburden removal. This test plan establishes procedures for collecting and validating the digface characterization data sets. Analysis of these data will focus on testing and further developing analysis methods for object detection and classification during overburden removal.

1852 (FEMP-2322) Demonstration of in situ-constructed horizontal soil containment barrier at Fernald. Pettit, P.J. (Fernald Environmental Restoration Management Corp., Fernald, OH (United States)); Ridenour, D.; Walker, J.; Saugier, K. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940225-119: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94016580. Source: OSTI; NTIS; INIS; GPO Dep.

A new design of jet grouting tool that can be guided by horizontal well casings and that operates in the horizontal plane has been used for the in situ placement of grout and construction of a prototype horizontal barrier that is free of windows. Jet grouting techniques have been advanced to permit construction of horizontal barriers underneath contaminated soil without having to excavate or disturb the

waste. The paper describes progress on the Fernald Environmental Restoration Management Corporation (FERMCO) In Situ Land Containment Project which is sponsored by the US Department of Energy's (DOE) Office of Technology Development (OTD) for DOE's Fernald Environmental Management Project (FEMP). The Fernald project is to demonstrate a novel, enabling technology for the controlled underground placement of horizontal panels of grout, and the joining of adjacent panels to construct practical, extensive barriers. Construction strategy, equipment mechanics and operating details of this new method are described.

1853 (FEMP-2323) Land containment system: Horizontal grout barrier: A method for in situ waste management. Ridenour, D.E. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Saugier, R.K. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940632-24: Annual meeting and exhibition of the Air and Waste Management Association, Cincinnati, OH (United States), 19-24 Jun 1994). Order Number DE94016579. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE has a number of sites where wastes can potentially leak into the ground and escape into the environment. Both the DOE and others are faced with a need to control a wide variety of pollutants on land: leaking underground storage tanks, unstabilized soluble wastes entering the groundwater, leachates from dump sites and other sources. Current technologies require either removal and repackaging of the waste from its existing location or, the ability to tie vertical barrier walls into an underlying impermeable layer to contain leaking wastes. Necessary elements in control are land containment systems capable of completely surrounding and holding the contamination until it is removed, stabilized and/or treated in situ. Horizontal barrier placement technology as currently practiced is not highly developed. A search of the barrier industry indicates that no other existing/developed technique is as capable as the innovative horizontal grout barrier method promises to be in providing means for vertical containment of preexisting land disposed materials. The primary competitive technologies are triple rod jet grouting and freeze walls.

1854 (FEMP-2370) In situ construction of horizontal soil containment barrier at Fernald. Ridenour, D. (FERMCO, Cincinnati, OH (United States). Fernald Environmental Management Project); Pettit, P.J.; Walker, J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216-96: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95009117. Source: OSTI; NTIS; INIS; GPO Dep.

An innovative method of placing soil barriers to contain vertical flow is being prepared for demonstration by the Fernald Environmental Restoration Management Corporation (FERMCO), working in conjunction with the Department of Energy Office of Technology Development (DOE/OTD) and two principle subcontractors. The method employs proven directional drilling techniques, jet grouting technology and unique placement tooling to form horizontal soil barriers in situ. This is done without disturbance to existing land disposed wastes. This paper is a summary report on the current state of that demonstration, including: a discussion

of the construction methods, the results of the initial tool tests, an overview of the Fernald site conditions and, the resulting path of tooling development for the second phase of tool testing.

1855 (INEL-94/0001) Innovative grout/retrieval demonstration final report. Loomis, G.G.; Thompson, D.N. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008673. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of an evaluation of an innovative retrieval technique for buried transuranic waste. Application of this retrieval technique was originally designed for full pit retrieval; however, it applies equally to a hot spot retrieval technology. The technique involves grouting the buried soil waste matrix with a jet grouting procedure, applying an expansive demolition grout to the matrix, and retrieving the debris. The grouted matrix provides an agglomeration of fine soil particles and contaminants resulting in an inherent contamination control during the dusty retrieval process. A full-scale field demonstration of this retrieval technique was performed on a simulated waste pit at the Idaho National Engineering Laboratory. Details are reported on all phases of this proof-of-concept demonstration including pit construction, jet grouting activities, application of the demolition grout, and actual retrieval of the grouted pit. A quantitative evaluation of aerosolized soils and rare earth tracer spread is given for all phases of the demonstration, and these results are compared to a baseline retrieval activity using conventional retrieval means. 8 refs., 47 figs., 10 tabs.

1856 (INEL-94/0004) Test plan for BWID Phase 2 electric arc melter vitrification tests. Soelberg, N.R.; Turner, P.C.; Oden, L.L.; Anderson, G.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008622. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the Buried Waste Integrated Demonstration (BWID), Phase 2, electric arc melter, waste treatment evaluation tests to be performed at the US Bureau of Mines (USBM) Albany Research Center. The BWID Arc Melter Vitrification Project is being conducted to evaluate and demonstrate existing industrial arc melter technology for thermally treating mixed transuranic-contaminated wastes and soils. Phase 1 baseline tests, performed during fiscal year 1993 at the USBM, were conducted on waste feeds representing incinerated buried mixed wastes and soils. In Phase 2, surrogate feeds will be processed that represent actual as-retrieved buried wastes from the Idaho National Engineering Laboratory's Subsurface Disposal Area at the Radioactive Waste Management Complex.

1857 (INEL-94/00142) A preliminary parametric performance assessment for the disposal of alpha-contaminated mixed low-level waste stored at the Idaho National Engineering Laboratory. Smith, T.H. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Anderson, G.L.; Myers, J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950216-87: Waste management

'95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008613. Source: OSTI; NTIS; INIS; GPO Dep.

A preliminary parametric performance assessment (PA) has been performed of potential waste disposal systems for alpha-contaminated mixed low-level waste (ALLW) currently stored at the Idaho National Engineering Laboratory. The radionuclide-confinement performance of treated ALLW in various final waste forms, in various disposal locations, and under various assumptions was evaluated. Compliance with performance objectives was assessed for the undisturbed waste scenario and for intrusion scenarios. Some combinations of final waste form, disposal site, and environmental transport assumptions lead to calculated doses that comply with the performance objectives, while others do not. The results will help determine the optimum degree of ALLW immobilization to satisfy the performance objectives while minimizing cost.

1858 (INEL-94/0173) An integrated systems approach to remote retrieval of buried transuranic waste using a telerobotic transport vehicle, innovative end effector, and remote excavator. Smith, A.M. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Rice, P.; Hyde, R.; Peterson, R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1995. 240p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008667. Source: OSTI; NTIS; INIS; GPO Dep.

Between 1952 and 1970, over two million cubic feet of transuranic mixed waste was buried in shallow pits and trenches in the Subsurface Disposal Area at the Idaho National Engineering Laboratory Radioactive Waste Management Complex. Commingled with this two million cubic feet of waste is up to 10 million cubic feet of fill soil. The pits and trenches were constructed similarly to municipal landfills with both stacked and random dump waste forms such as barrels and boxes. The main contaminants are micron-sized particles of plutonium and americium oxides, chlorides, and hydroxides. Retrieval, treatment, and disposal is one of the options being considered for the waste. This report describes the results of a field demonstration conducted to evaluate technologies for excavating, and transporting buried transuranic wastes at the INEL, and other hazardous or radioactive waste sites throughout the US Department of Energy complex. The full-scale demonstration, conducted at RAHCO International's facilities in Spokane, Washington, in the summer of 1994, evaluated equipment performance and techniques for digging, dumping, and transporting buried waste. Three technologies were evaluated in the demonstration: an Innovative End Effector for dust free dumping, a Telerobotic Transport Vehicle to convey retrieved waste from the digface, and a Remote Operated Excavator to deploy the Innovative End Effector and perform waste retrieval operations. Data were gathered and analyzed to evaluate retrieval performance parameters such as retrieval rates, transportation rates, human factors, and the equipment's capability to control contamination spread.

1859 (INEL-95/0039) In situ encapsulation bench-scale demonstration report FY-94 (for TTP-ID 142012). Weidner, J.R.; Shaw, P.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008671. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the test objectives, procedures, and results of the laboratory-scale tests of in situ waste encapsulation of buried waste using a synthetic analogue of natural cement. The products of the reaction $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} + \text{Ca}(\text{OH})_2 = \text{gypsum} + \text{iron oxide/hydroxide}$ were examined as a possible waste encapsulation material for application at the Subsurface Disposal Area at the Idaho National Engineering Laboratory. This technique for transuranic waste encapsulation is being pursued by the Buried Waste Integrated Demonstration as a possible candidate containment and stabilization method for geologic time. The data indicate that the iron waste encapsulation materials tested are appropriate choices for the intended purpose. Based on these observations and conclusions, full-scale tests are recommended to determine the performance of the iron waste isolation materials under field conditions and for extended time periods. The viscosity of the reagents indicates that jet grouting is probably an appropriate application method.

1860 (ITRI-144, pp. 1-4) Determination of aerosol size distributions at uranium mill tailings remedial action project sites. Newton, G.J. (CWM Federal Environmental Services, Inc., Albuquerque, NM (United States)); Reif, R.H.; Hoover, M.D. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst. Nov 1994. DOE Contract AC04-76EV01013. In *Inhalation Toxicology Research Institute annual report, October 1, 1993-September 30, 1994*. 211p. Order Number DE95007526. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has an ongoing program, the Uranium Mill Tailings Remedial Action (UMTRA) Project, to stabilize piles of uranium mill tailings in order to reduce the potential radiological hazards to the public. Protection of workers and the general public against airborne radioactivity during remedial action is a top priority at the UMTRA Project. The primary occupational radionuclides of concern are ^{230}Th , ^{226}Ra , ^{210}Pb , ^{210}Po , and the short-lived decay products of ^{222}Rn with ^{230}Th causing the majority of the committed effective dose equivalent (CEDE) from inhaling uranium mill tailings. Prior to this study, a default particle size of $1.0 \mu\text{m}$ activity median aerodynamic diameter (AMAD) was assumed for airborne radioactive tailings dust. Because of recent changes in DOE requirements, all DOE operations are now required to use the CEDE methodology, instead of the annual effective dose equivalent (AEDE) methodology, to evaluate internal radiation exposures. Under the transition from AEDE to CEDE, with a $1.0 \mu\text{m}$ AMAD particle size, lower bioassay action levels would be required for the UMTRA Project. This translates into an expanded internal dosimetry program where significantly more bioassay monitoring would be required at the UMTRA Project sites. However, for situations where the particle size distribution is known to differ significantly from $1.0 \mu\text{m}$ AMAD, the DOE allows for corrections to be made to both the estimated dose to workers and the derived air concentration (DAC) values. For particle sizes larger than $1.0 \mu\text{m}$ AMAD, the calculated CEDE from inhaling tailings would be relatively lower.

1861 (LA-SUB-94-139) Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico. Los Alamos National Lab., NM (United States); Stephens (Daniel B.) and Associates, Inc., Albuquerque, NM (United States). 19 Nov 1993. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

W-7405-ENG-36. Order Number DE95001749. Source: OSTI; NTIS; INIS; GPO Dep.

A numerical model, TOUGH2, was selected for describing liquid- and gas-phase flow in the unsaturated tuff underlying the TA-73 landfill. The model was selected primarily for its ability to simulate the significant mechanisms that may affect transport of contaminants through the vadose zone at the TA-73 landfill, including non-isothermal flow through fractured media. TOUGH2 is the best documented, verified, and validated model capable of performing the required simulations. The sensitivity analyses that were performed and describes in this report identified the input parameters that the selected numerical model is most sensitive to. The input parameters analyzed were saturated hydraulic conductivity, van Genuchten α and n , residual and saturated moisture contents, infiltration rate, fracture spacing and permeability, atmospheric pressure, and temperature. The sensitivity analyses were performed using a model grid that was designed to incorporate the regions in the landfill vicinity where contaminant transport is likely to occur and where the physical processes affecting flow and transport are the most dynamic. The sensitivity analyses performed suggest that the model is quite sensitive to a number of input parameters, including saturated hydraulic conductivity, the van Genuchten parameters α and n (for both the tuff matrix and fractures), fracture density and aperture, and atmospheric pressure. The results indicate that additional site-specific hydraulic properties and fracture data should be obtained before attempting to perform predictive, numerical simulations of gas- and liquid-phase flow beneath the landfill.

1862 (LA-UR-94-924) Use of the time domain reflectometry in hydraulic studies of multilayered landfill covers for closure of waste landfills at Los Alamos, New Mexico. Nyhan, J.W.; Schofield, T.G.; Martin, C.E. Los Alamos National Lab., NM (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940986-3: Time domain reflectometry in environmental, infrastructure and mining applications symposium, Evanston, IL (United States), 6-7 Sep 1994). Order Number DE94009359. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory examined water balance relationships for four different landfill cover designs containing hydraulic and capillary engineered barriers. Seepage is being evaluated as a function of slope length for each plot, as well as interflow, runoff, and precipitation, using an automated water flow datalogging system that routinely collects hourly data. Soil water content within these 16 field plots has been routinely monitored four times a day since November 1991 using time domain reflectometry techniques with an automated and multiplexed measurement system. Volumetric water content is measured with a pair of 60-cm-long waveguides at each of 212 locations. One set of waveguides was emplaced vertically in four locations in every soil layer to determine soil water inventory in each field plot. A second set of waveguides was emplaced horizontally in several soil layers to provide a more detailed picture of soil water dynamics close to soil layer interfaces. Field data is presented showing pulses of soil water moving through the soil and engineered barriers with high temporal and spatial resolution.

1863 (LA-UR-94-981) Comparison of neutron probe and time domain reflectometry techniques of soil moisture analysis. Schofield, T.G.; Langhorst, G.J.; Trujillo, G.; Bostick, K.V.; Hansen, W.R. Los Alamos National Lab., NM

(United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940986-2: Time domain reflectometry in environmental, infrastructure and mining applications symposium, Evanston, IL (United States), 6-7 Sep 1994). Order Number DE94009347. Source: OSTI; NTIS; GPO Dep.

The Environmental Science Group of Los Alamos National Laboratory collected soil water content data using Time Domain Reflectometry (TDR) and neutron probe in order to correlate the results from the two techniques in a study performed at Los Alamos, NM. Two well-characterized field plots (3m x 10m) were instrumented with TDR waveguides and neutron probe access tubes at four locations. At each location, TDR rod pairs were placed horizontally at 5-, 15-, 30-, 45- and 60-cm depths and vertical sets of rod pairs with lengths of 15-, 30-, 45- and 60-cm were installed. Neutron probe measurements were taken at 15-, 30-, 45- and 60-cm depths. Because the neutron probe measures a spherical volume, soil water content values were compared with horizontal TDR readings averaged over the same zone. Additionally, vertical TDR readings were compared to neutron probe readings averaged over the depths corresponding to each TDR length. Measurements for each technique were taken weekly since Fall of 1992. A time series comparison of the results is presented.

1864 (LA-UR-94-1735) Reductive dissolution approaches to removal of uranium from contaminated soils. Brainard, J.R.; Iams, H.D.; Strietelmeier, B.A.; Del-Rio Garcia, M. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225-113: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 Mar 1994). Order Number DE94012926. Source: OSTI; NTIS; INIS; GPO Dep.

Traditional approaches to uranium recovery from ores have employed oxidation of U(IV) minerals to form the uranyl cation which is subsequently complexed by carbonate or maintained in solution by strong acids. Reductive approaches for uranium decontamination have been limited to removing soluble uranium from solutions by formation of U^{4+} which readily hydrolyses and precipitates. As part of the Uranium in Soils Integrated Demonstration, we have developed a reductive approach to solubilization of uranium from contaminated soils which employs reduction to destabilize U(VI) solid and sorbed species, and strong chelators for U(IV) to prevent hydrolysis and solubilize the reduced form. This strategy has particular application to sites where the uranium is present primarily as intractable U(VI) phases and where high fractions of the contamination must be removed to meet regulatory requirements.

1865 (LA-UR-94-2664) Water balance relationships in four alternative cover designs for radioactive and mixed waste landfills. Warren, R.W. (Colorado State Univ., Ft. Collins, CO (United States)); Hakonson, T.E.; Trujillo, G. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940815-73: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94016188. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results are presented from a field study to evaluate the relative hydrologic performance of various landfill capping technologies installed by the Los Alamos

National Laboratory at Hill Air Force Base, Utah. Four cover designs (two Los Alamos capillary barrier designs, one modified EPA RCRA design, and one conventional design) were installed in large lysimeters instrumented to monitor the fate of natural precipitation between 01 January 1990 and 20 September 1993. After 45 months of study, results showed that the cover designs containing barrier layers were effective in reducing deep percolation as compared to a simple soil cap design. The RCRA cover, incorporating a clay hydraulic barrier, was the most effective of all cover designs in controlling percolation but was not 100% effective. Over 90% of all percolation and barrier lateral flow occurred during the months of February through May of each year, primarily as a result of snow melt, early spring rains and low evapotranspiration. Gravel mulch surface treatments (70–80% coverage) were effective in reducing runoff and erosion. The two plots receiving gravel mulch treatments exhibited equal but enhanced amounts of evapotranspiration despite the fact that one plot was planted with additional shrubs.

1866 (LA-UR-94-3121) Decision support system to select cover systems. Bostick, K.V. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006447. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this technology is to provide risk managers with a defensible, objective way to select capping alternatives for remediating radioactive and mixed waste landfills. The process of selecting containment cover technologies for mixed waste landfills requires consideration of many complex and interrelated technical, regulatory, and economic issues. A Decision Support System (DSS) is needed to integrate the knowledge of experts from scientific, engineering, and management disciplines to help in selecting the best capping practice for the site.

1867 (LA-UR-94-3196) Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring. Filippone, C.L.; Schofield, T.G. Los Alamos National Lab., NM (United States). Aug 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95000911. Source: OSTI; NTIS; INIS; GPO Dep.

Horizontal and vertical measurements of moisture content were obtained daily using time domain reflectometry (TDR) at four sites in two crushed tuff experimental plots over a period of 287 days. Moisture contents were also measured weekly at the same locations and at two additional locations in the plots using the neutron probe method. Results are assessed to determine the influence of waveguide length and waveguide orientation on TDR moisture content measurements, the degree of spatial variability in measured moisture content in this engineered porous material, and the ability of TDR to resolve vertical moisture content gradients. Recommendations are made for TDR instrumentation of mixed waste landfill monitoring systems.

1868 (LA-UR-94-3252) Planning document for the Advanced Landfill Cover Demonstration. Hakonson, T.E. (Colorado State Univ., Fort Collins, CO (United States). Center for Ecological Risk Assessment & Management); Bostick, K.V. Los Alamos National Lab., NM (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95000941. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy and Department of Defense are faced with the closure of thousands of decommissioned radioactive, hazardous, and mixed waste landfills as a part of ongoing Environmental Restoration activities. Regulations on the closure of hazardous and radioactive waste landfills require the construction of a "low-permeability" cover over the unit to limit the migration of liquids into the underlying waste. These landfills must be maintained and monitored for 30 years to ensure that hazardous materials are not migrating from the landfill. This test plan is intended as an initial road map for planning, designing, constructing, evaluating, and documenting the Advanced Landfill Cover Demonstration (ALCD). It describes the goals/objectives, scope, tasks, responsibilities, technical approach, and deliverables for the demonstration.

1869 (PNL-10131) Electrochemical organic destruction in support of Hanford tank waste pretreatment. Lawrence, W.E.; Surma, J.E.; Gervais, K.L.; Buehler, M.F.; Pillay, G.; Schmidt, A.J. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002854. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's Hanford Site in Richland, Washington, has 177 underground storage tanks that contain approximately 61 million gallons of radioactive waste. The current cleanup strategy is to retrieve the waste and separate components into high-level and low-level waste. However, many of the tanks contain organic compounds that create concerns associated with tank safety and efficiency of anticipated separation processes. Therefore, a need exists for technologies that can safely and efficiently destroy organic compounds. Laboratory-scale studies conducted during FY 93 have shown proof-of-principle for electrochemical destruction of organics. Electrochemical oxidation is an inherently safe technology and shows promise for treating Hanford complexant concentrate aqueous/slurry waste. Therefore, in support of Hanford tank waste pretreatment needs, the development of electrochemical organic destruction (ECOD) technology has been undertaken. The primary objective of this work is to develop an electrochemical treatment process for destroying organic compounds, including tank waste complexants. Electroanalytical analyses and bench-scale flow cell testing will be conducted to evaluate the effect of anode material and process operating conditions on the rate of organic destruction. Cyclic voltammetry will be used to identify oxygen overpotentials for the anode materials and provide insight into reaction steps for the electrochemical oxidation of complexants. In addition, a bench-scale flow cell evaluation will be conducted to evaluate the influence of process operating conditions and anode materials on the rate and efficiency of organic destruction using the nonradioactive a Hanford tank waste simulant.

1870 (PNL-10164) Recovery of silver from CEPOD anolyte solutions. Blanchard, D.L. (Pacific Northwest Lab., Richland, WA (United States)); Surma, J.E.; Alexander, D.L.; Shade, E.H.; Matheson, J.D.; Cochran, D.L.; Wheelwright, E.J.; Boyd, T. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000831. Source: OSTI; NTIS; INIS; GPO Dep.

The process known as Catalyzed Electrochemical Plutonium Oxide Dissolution (CEPOD) has been shown effective for removing plutonium from a variety of residues and solids. This process involves the electrochemical oxidation of PuO₂

(and other Pu species) to $(\text{PuO}_2)^{2+}$, and dissolution of the latter species in the anode solution (anolyte). Silver is used to transfer charge from the electrodes to the solid Pu oxide. Ag (I) is oxidized at the anode to Ag(II) and carried by the solution to the plutonium oxide solids, where the silver and oxide undergo a redox reaction that converts Pu(IV) to Pu(VI), and Ag(II) to Ag(I). Other metal ions [such as Ce(IV) and Co(III)] may also be used for this charge transfer, but have been found to be less effective than silver. The same process may be used to destroy various organic materials (such as paper and wood, oil and fuels, and synthetic polymer materials) by complete oxidation to CO_2 or H_2O , for example. Upon completion of a CEPOD dissolver run, the anolyte may be processed to remove solution species of interest (i.e., Pu), or the anolyte may be recycled, or disposed. Because silver is a Resource Conservation and Recovery Act (RCRA) land ban material, it must be removed from waste streams. Preliminary experiments, completed in FY 1991, demonstrated a simple, effective technique for silver removal from solutions. Ascorbic acid ($\text{C}_6\text{H}_8\text{O}_6$) Was Used to reduce silver ion to metallic silver, which precipitates from solution. The process was demonstrated effective on a bench scale using samples of actual CEPOD anolyte. Further experiments, in FY 1993, optimized these parameters and demonstrated the effectiveness of the technique on CEPOD anolyte on a larger, process scale (liters of solution). This report describes both the preliminary bench-scale experiments and the more recent process-scale experiments. The results are also compared to electro-deposition, another method of silver ion removal.

1871 (PNL-10485) Application of in situ vitrification in the soil subsurface: Engineering-scale testing. Luey, J.; Seiler, D.K. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010204. Source: OSTI; NTIS; INIS; GPO Dep.

Engineering-scale testing to evaluate the initiation and propagation of the in situ vitrification (ISV) process in the soil subsurface has been completed. Application of ISV in the soil subsurface both increases the applicable treatment depth (beyond a demonstrated 5 m) and allows treatment of local contamination, such as liquid seepage trenches (found on many US Department of Energy sites) that were designed to remove contamination at the bottom of the trench. The following observations and conclusions resulted from the test data: the ISV process can be initiated in the soil subsurface and propagated in both vertical directions, with the downward direction providing greater ease of operation; energy efficiency to process a kilogram of soil was 20% better than for an ISV melt initiated at the soil surface, increased efficiency was attributed to insulation from the soil overburden; the feasibility of initiating the process with a planar starter path was confirmed, thus increasing the number of options for initiating the process in the field; soil subsidence was pronounced and requires attention before field demonstration of subsurface ISV. Further field work at pilot-scale is recommended for this new ISV application. The key step will be the placement of starter material at depth to initiate the process.

1872 (PNL-SA-24382) Development of in situ vitrification for remediation of ORNL contaminated soils. Tixier, J.S. (Pacific Northwest Lab., Richland, WA (United States)); Spalding, B.P. Pacific Northwest Lab., Richland, WA (United States); Oak Ridge National Lab., TN (United States). Aug 1994. 7p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC06-76RL01830 ; AC05-84OR21400. (CONF-940815-97: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94018915. Source: OSTI; NTIS; INIS; GPO Dep.

A full-scale field treatability study of in situ vitrification (ISV) is underway at the Oak Ridge National Laboratory (ORNL) for the remediation of radioactive liquid waste seepage pits and trenches that received over one million curies of mixed fission products (mostly ^{137}Cs and ^{90}Sr) during the 1950s and 1960s. The treatability study is being conducted on a portion of the original seepage pit and will support an Interim Record of Decision (IROD) for closure of one or more of the seven seepage pits and trenches in early fiscal year (FY) 1996. The treatability study will establish the technical performance of ISV for remediation of the contaminated soil sites. Melt operations at ORNL are expected to begin in early FY 1994. This paper presents the latest accomplishments of the project in preparation for the field testing. Discussion centers on the results of a parametric crucible melt study, a description of the site characterization efforts, and the salient features of a new hood design.

1873 (PNL-SA-24508) Control of Eolian soil erosion from waste site surface barriers. Ligothe, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-14: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007285. Source: OSTI; NTIS; INIS; GPO Dep.

Physical models were tested in a wind tunnel to determine optimum surface-gravel admixtures for protecting silt-loam soil from erosion by wind and saltating sand stresses. The tests were performed to support the development of a natural-material surface barrier for and waste sites. Plans call for a 2-m deep silt-loam soil reservoir to retain infiltrating water from rainfall and snowmelt. The objective of the study was to develop a gravel admixture that would produce an erosion-resistant surface layer during periods of extended dry climatic stress. Thus, tests were performed using simulated surfaces representing dry, unvegetated conditions present just after construction, after a wildfire, or during an extended drought. Surfaces were prepared using silt-loam soil mixed with various grades of sand and gravel. Wind-induced surface shear stresses were controlled over the test surfaces, as were saltating sand mass flow rates and intensities. Tests were performed at wind speeds that approximated and exceeded local 100-year peak gust intensities. Surface armors produced by pea gravel admixtures were shown to provide the best protection from wind and saltating sand stresses. Compared with unprotected silt-loam surfaces, armored surfaces reduced erosion rates by more than 96%. Based in part on wind tunnel results, a pea gravel admixture of 15% will be added to the top 1 in of soil in a prototype barrier under construction in 1994. Field tests are planned at the prototype site to provide data for comparison with wind tunnel results.

1874 (PNL-SA-24683) Transport of radioactive ions in soil by electrokinetics. Buehler, M.F.; Surma, J.E.; Virden, J.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941016-4: Materials week '94, Rosemont, IL

(United States), 3-7 Oct 1994). Order Number DE95004911. Source: OSTI; NTIS; INIS; GPO Dep.

An electrokinetic approach is being evaluated for in situ soil remediation at the Hanford Site in Richland, Washington. This approach uses an applied electric field to induce transport of both radioactive and hazardous waste ions in soil. The work discussed in this paper involves the development of a new method to monitor the movement of the radioactive ions within the soil during the electrokinetic process. A closed cell and a gamma counter were used to provide in situ measurements of ^{137}Cs and ^{60}Co movement in Hanford soil. Preliminary results show that for an applied potential of 200 V over approximately 200 hr, ^{137}Cs and ^{60}Co were transported a distance of 4 to 5 in. The monitoring technique demonstrated the feasibility of using electrokinetics for soil separation applications.

1875 (PNL-SA-24752) Treatment of simulated INEL buried wastes using a graphite electrode DC arc furnace. Surma, J.E. (Pacific Northwest Lab., Richland, WA (United States)); Lawrence, W.E.; Titus, C.H.; Wittle, J.K.; Hamilton, R.A.; Cohn, D.R.; Rhea, D.; Thomas, P.; Woskov, P.P. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-98: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94018912. Source: OSTI; NTIS; INIS; GPO Dep.

A program has been established under the auspices of the Department of Energy (DOE), Office of Technology Development (OTD), to develop the graphite electrode DC arc technology for the application of treating buried heterogeneous solid wastes. A three way "National Laboratory-University-Industry" partnership was formed to develop this technology in the most timely and cost effective manner. This program is presently testing a newly fabricated pilot-scale DC arc furnace with associated diagnostics at the Plasma Fusion Center at the Massachusetts Institute of Technology. Initial testing in a smaller engineering scale furnace has established the viability of this technology for the treatment of solid heterogeneous wastes. Two diagnostic tools were developed under this program which support the evaluation of the DC arc technology. The diagnostics provide for both spatially resolved temperature measurements within the furnace and real time monitoring of the furnace metal emissions.

1876 (PNL-SA-24899) Depth enhancement techniques for the in situ vitrification process. Lowery, P.S. (Pacific Northwest Lab., Richland, WA (United States)); Luey, J.; Seiler, D.K.; Tixier, J.S.; Timmerman, C.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124-20: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007802. Source: OSTI; NTIS; INIS; GPO Dep.

In-situ vitrification (ISV) is a process by which electrical energy is supplied to a soil/waste matrix. The resulting Joule heat raises the temperature of the soil/waste matrix, producing a pool of molten soil. Since its inception, there have been many successful applications of the technology to both staged and actual waste sites. However, there has been some difficulty in extending the attainable treatment melt

depth to levels greater than 5 m. Results obtained from application of two novel approaches for extending the ultimate treatment depth attainable with in-situ vitrification (ISV) are presented. In the first, the electrode design is modified to concentrate the Joule heat energy delivered to the soil/waste matrix in the lower region of the target melt zone. This electrode design has been dubbed the hot-tip electrode. Results obtained from both computational and experimental investigations of this design concept indicate that some benefit toward ISV depth enhancement was realized with these hot-tip electrodes. A second, alternative approach to extending process depth with ISV involves initiating the melt at depth and propagating it in either vertical direction (e.g., downward, upward, or both) to treat the target waste zone. A series of engineering-scale experiments have been conducted to assess the benefits of this approach. The results from these tests indicate that ISV may be effectively initiated and sustained using this subsurface start-up technique. A survey of these experiments and the associated results are presented herein, together with brief discussion of some considerations regarding setup and implementation of this subsurface start-up technique.

1877 (PNL-SA-24936) Integration of pneumatic fracturing and in situ vitrification in the soil subsurface. Luey, J. (Pacific Northwest Lab., Richland, WA (United States)); Seiler, D.K.; Schuring, J.R. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-86: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009121. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory is evaluating ways to increase the applicability of the in situ vitrification (ISV) process at hazardous and radioactive waste sites. One innovation is the placement of a conductive material that will facilitate initiating the ISV process at a target depth. A series of laboratory tests performed at the New Jersey Institute of Technology (NJIT) assessed the feasibility of pneumatic fracturing (PF) in the highly permeable soils of the Hanford Site. The NJIT tests included an analysis of Hanford soils, a series of PF injection tests, and a parametric analysis to determine how soil properties affect the PF process. Results suggest that the PF process can be applied to Hanford soils and that dry medium (e.g., conductive material such as graphite flake) can be injected into the fracture. This paper describes the laboratory testing performed at NJIT, its results, and the application of those results to plans for a field demonstration at Hanford.

1878 (PNL-SA-25672) The Sort on Radioactive Waste Type Model: A method to sort single-shell tanks into characteristics groups. Hill, J.G. (Pacific Northwest Lab., Richland, WA (United States)); Anderson, G.S.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-84: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008933. Source: OSTI; NTIS; INIS; GPO Dep.

The Sort on Radioactive Waste Type (SORWT) Model is a method to categorize Hanford Site single-shell tanks (SSTS) into groups of tanks expected to exhibit similar chemical and physical characteristics based on their major waste types and processing histories. The model has identified 24 different waste-type groups encompassing 133 of the 149 SSTS

and 93% of the total waste volume in SSTs. The remaining 16 SSTs and associated wastes could not be grouped, according to the established criteria and were placed in an ungrouped category. A detailed statistical verification study has been conducted that employs analysis of variance (ANOVA) and the core sample analysis data collected since 1989. These data cover eight tanks and five SORWT groups. The verification study showed that these five SORWT groups are highly statistically significant; they represent approximately 10% of the total waste volume and 26% of the total sludge volume in SSTs. Future sampling recommendations based on the SORWT Model results include 32 core samples from 16 tanks and 18 auger samples from six tanks. Combining these data with the existing body of information will form the basis for characterizing 98 SSTs (66%). These 98 SSTs represent 78% of the total waste volume, 61% of the total sludge volume, and 88 % of the salt cake volume.

1879 (SAND-94-0676C) Water removal from a dry barrier cover system. Stormont, J.C. (Sandia National Labs., Albuquerque, NM (United States)); Ankeny, M.D.; Tansey, M.K. Sandia National Labs., Albuquerque, NM (United States). [1994]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941124-3: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94008617. Source: OSTI; NTIS; INIS; GPO Dep.

The results of the numerical simulations reveal that horizontal air flow through the coarse with reasonable pressure gradients can remove large quantities of water from the cover system. Initially, the water removal from the cover system is dominated by the evaporation and advection of water vapor out of the coarse layer. Once the coarse layer is dry, removal of water by evaporation near the fine/coarse layer interface reduces the local water content and water potential, and water moves toward the fine-coarse layer interface and becomes available for evaporation. This result is important in that it suggests the fine layer water content may be moderated by air flow in the coarse layer. Incorporating diffusion of water vapor from the fine layer into the coarse layer substantially increases the water movement out of the fine layer.

1880 (SAND-94-1657C) An overview of the Mixed Waste Landfill Integrated Demonstration. Williams, C.V.; Burford, T.D.; Betsill, J.D. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940815-49: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94014248. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Landfill Integrated Demonstration (MWLID) focuses on "in-situ" characterization, monitoring, remediation, and containment of landfills in and environments that contain hazardous and mixed waste. The MWLID mission is to assess, demonstrate, and transfer technologies and systems that lead to faster, better, cheaper, and safer cleanup. Most important, the demonstrated technologies will be evaluated against the baseline of conventional technologies. Key goals of the MWLID are routine use of these technologies by Environmental Restoration Groups throughout the DOE complex and commercialization of these technologies to the private sector.

The MWLID is demonstrating technologies at hazardous waste landfills located at Sandia National Laboratories and on Kirtland Air Force Base. These landfills have been selected because they are representative of many sites throughout the Southwest and in other and climates.

1881 (SAND-94-2248C) Alternative barrier layers for surface covers in dry climates. Stormont, J.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409203-1: Geo-environmental issues facing the Americas, Mayaguez (Puerto Rico), 20 Sep 1994). Order Number DE94018908. Source: OSTI; NTIS; INIS; GPO Dep.

Surface covers are one of the most widespread remediation and waste management options in all climates. Barrier layers to limit percolation through cover systems are principal features of engineered, multi-component cover designs. Conventional barrier layer components developed for humid climates have limitations in dry climates. One alternative barrier layer is a capillary barrier, which consists of a fine-over-coarse soil arrangement. The capacity of capillary barrier to laterally divert downward moving water is the key to their success. Another alternative is a dry barrier, in which atmospheric air is circulated through a coarse layer within the cover to remove water vapor. Incorporating a coarse layer which stores water for subsequent removal by air flow reduces the requirements for the air flow velocity and increases the applicability of the dry barrier.

1882 (SAND-95-0014C) Environmental Measurement While-Drilling system for real-time field screening of contaminants. Lockwood, G.J.; Normann, R.A.; Bishop, L.B.; Floran, R.J.; Williams, C.V. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504114-1: North American nodig '95, Toronto (Canada), 30 Apr - 3 May 1995). Order Number DE95005428. Source: OSTI; NTIS; INIS; GPO Dep.

Sampling during environmental drilling is essential to fully characterize the spatial distribution and migration of near surface contaminants. However, the analysis of these samples is not only expensive, but can take weeks or months when sent to an off-site laboratory. In contrast, measurement-while-drilling (MWD) screening capability could save money and valuable time by quickly distinguishing between contaminated and uncontaminated areas. Real-time measurements provided by a MVM system would enable on-the-spot decisions to be made regarding sampling strategies, enhance worker safety, and provide the added flexibility of being able to "steer" the drill bit in or out hazardous zones. During measurement-while-drilling, down-hole sensors are located behind the drill bit and linked by a rapid data transmission system to a computer at the surface. As drilling proceeds, data are collected on the nature and extent of the subsurface contamination in real-time. The down-hole sensor is a Geiger-Mueller tube (GMT) gamma radiation detector. In addition to the GMT signal, the MWD system monitors these required down-hole voltages and two temperatures associated with the detector assembly. The Gamma Ray Detection System (GRDS) and electronics package are discussed in as well as the results of the field test. Finally, our conclusions and discussion of future work are presented.

1883 (SAND-95-0070C) Innovative site characterization demonstration saves time and money. Floran, R.J.

(Sandia National Labs., Albuquerque, NM (United States)); Bujewski, G.E.; Johnson, R.L. Sandia National Labs., Albuquerque, NM (United States); Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-18: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006225. Source: OSTI; NTIS; INIS; GPO Dep.

A technology demonstration that optimizes sampling strategies and real-time data collection was carried out at the Kirtland Air Force Base RB-11 Radioactive Burial Site, Albuquerque, New Mexico in August 1994. The project, which was funded by the Strategic Environmental Research and Development Program (SERDP), involved the application of a geostatistical-based "smart sampling" methodology and software with on-site field screening of soils for radiation, organic compounds and metals. The software, known as Plume™, was developed at Argonne National Laboratory as part of the DOE/OTD-funded Mixed Waste Landfill Integrated Demonstration (MWLID). The objective of the investigation was to compare an innovative Adaptive Sampling approach that stressed real-time decision-making with a conventional RCRA-driven site characterization carried out by the Air Force. The latter investigation used a standard drilling and sampling plan as mandated by the EPA. To make the comparison realistic, the same contractors and sampling equipment (Geoprobe® soil samplers) were used. In both investigations, soil samples were collected at several depths at numerous locations adjacent to burial trenches that contain low-level radioactive waste and animal carcasses. Neither study revealed the presence of contaminants appreciably above risk based action levels, indicating that minimal to no migration has occurred away from the trenches. The combination of Adaptive Sampling with field screening achieved a similar level of confidence compared to the RCRA investigation regarding the potential migration of contaminants at the site. By comparison, the Adaptive Sampling program drilled 28 locations (vs. 36 for the conventional investigation), collected 81 samples (vs. 163), and sent 15 samples (vs. 163) off-site for laboratory analysis. In addition, the field work took 3 1/2 days compared to 13 days for the RCRA investigation.

1884 (SAND-95-0195C) Using high-density magnetic and electromagnetic data for waste site characterization: A case study. Cochran, J.R. (Sandia National Labs., Albuquerque, NM (United States)); Dalton, K.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950450-2: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL (United States), 23-27 Apr 1995). Order Number DE95008548. Source: OSTI; NTIS; INIS; GPO Dep.

Magnetometers are frequently used to characterize hazardous waste sites. Due to cost and time considerations, data are typically collected on a coarse grid with nodes on 3 to 6 meter (m) centers. Hardware and software are now available which allow the rapid and cost effective collection of information on a much finer sampling grid. In this paper we present and compare total field magnetometry data collected on 3 m centers to total field magnetometry data collected on a grid with centers of 0.5 m or less. We also compare the magnetometry data to time-domain electromagnetic (EM) data collected on a 1 m by 0.2 m grid using the recently introduced Geonics Ltd. EM61 metal detector. All three data sets were collected at an abandoned landfill

radioactive Burial Site No. 11 (RB-11) is located on Kirtland Air Force Base near Albuquerque, New Mexico.

1885 (SAND-95-0289C) Transport processes investigation: A necessary first step in site scale characterization plans. Roepke, C. (Sandia National Labs., Albuquerque, NM (United States)); Glass, R.J.; Brainard, J.; Mann, M.; Kriel, K.; Holt, R.; Schwing, J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-77: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008532. Source: OSTI; NTIS; INIS; GPO Dep.

We propose an approach, which we call the Transport Processes Investigation or TPI, to identify and verify site-scale transport processes and their controls. The TPI aids in the formulation of an accurate conceptual model of flow and transport, an essential first step in the development of a cost effective site characterization strategy. The TPI is demonstrated in the highly complex vadose zone of glacial tills that underlie the Fernald Environmental Remediation Project (FEMP) in Fernald, Ohio. As a result of the TPI, we identify and verify the pertinent flow processes and their controls, such as extensive macropore and fracture flow through layered clays, which must be included in an accurate conceptual model of site-scale contaminant transport. We are able to conclude that the classical modeling and sampling methods employed in some site characterization programs will be insufficient to characterize contaminant concentrations or distributions at contaminated or hazardous waste facilities sited in such media.

1886 (UCRL-JC-115670) Real-time radiography, digital radiography, and computed tomography for nonintrusive waste drum characterization. Martz, H.E.; Schneberk, D.J.; Roberson, G.P. Lawrence Livermore National Lab., CA (United States). Jul 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940216-5: Nondestructive assay and nondestructive examination waste characterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE94016608. Source: OSTI; NTIS; INIS; GPO Dep.

We are investigating and developing the application of x-ray nondestructive evaluation (NDE) and gamma-ray nondestructive assay (NDA) methods to nonintrusively characterize 208-liter (55-gallon) mixed waste drums. Mixed wastes contain both hazardous and radioactive materials. We are investigating the use of x-ray NDE methods to verify the content of documented waste drums and determine if they can be used to identify hazardous and nonconforming materials. These NDE methods are also being used to help waste certification and hazardous waste management personnel at LLNL to verify/confirm and/or determine the contents of waste. The gamma-ray NDA method is used to identify the intrinsic radioactive source(s) and to accurately quantify its strength. The NDA method may also be able to identify some hazardous materials such as heavy metals. Also, we are exploring techniques to combine both NDE and NDA data sets to yield the maximum information from these nonintrusive, waste-drum characterization methods. In this paper, we report on our x-ray NDE R&D activities, while our gamma-ray NDA activities are reported elsewhere in the proceedings. We have developed a data, acquisition scanner for x-ray NDE real-time radiography (RTR), as well as digital radiography transmission computed tomography (TCT) along with associated computational techniques for

image reconstruction, analysis, and display. We are using this scanner and real-waste drums at Lawrence Livermore National Laboratory (LLNL). In this paper, we discuss some issues associated with x-ray imaging, describe the design construction of an inexpensive NDE drum scanner, provide representative DR and TCT results of both mock- and real-waste drums, and end with a summary of our efforts and future directions. The results of these scans reveal that RTR, DR, and CT imaging techniques can be used in concert to provide valuable information about the interior of low-level-, transuranic-, and mock-waste drums without, opening them.

1887 (UCRL-JC-118317) Characterization of waste drums using nonintrusive active and passive computed tomography. Roberson, G.P.; Martz, H.E.; Decman, D.J.; Camp, D.C.; Azevedo, S.G.; Keto, E.R. Lawrence Livermore National Lab., CA (United States). Aug 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940216-8: Nondestructive assay and nondestructive examination waste characterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE95008830. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a data acquisition scanner for gamma-ray nondestructive assay (NDA) active and passive computed tomography (A&PCT) along with associated computational techniques for image reconstruction, analysis, and display. We are using this scanner to acquire data sets of mock-waste drums at Lawrence Livermore National Laboratory (LLNL). In this paper, we discuss some issues associated with gamma-ray spectroscopy assay, NDA imaging, describe the design and construction of an NDA drum scanner and report on code development for image reconstruction. We also present representative A&PCT assay results of well characterized mock-waste drums. These preliminary results suggest that A&PCT imaging can be used to produce accurate absolute assays of radioactivity in real-waste drums.

1888 (WHC-EP-0834) Subsurface barrier feasibility evaluation: External review meeting report. Lindberg, S.L. (Bovay Northwest, Inc., Richland, WA (United States)); Rouse, J.K. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004975. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company - Tank Waste Remediation System Division (TWRS) Program is evaluating subsurface barrier technologies for potential use in supporting remediation of the Hanford Tank Farms for the US Department of Energy, Richland Operations Office (DOE-RL). An External Review Team (ERT) was assembled to perform an independent technical review of the work performed to-date supporting the evaluation process. A set of draft documents was forwarded to the ERT for their review, and a meeting was held August 10 through 12, 1994, to facilitate comments and resolutions. This document summarizes the meeting, the comments provided by the ERT, and the ongoing work to resolve the comments and support a pending decision by The US Department of Energy, Richland Operations Office; the Washington State Department of Ecology; and the US Environmental Protection Agency.

1889 (WHC-SA-1968) Improving revegetation success: Evaluation of several soil treatments. Hayward,

W.M.; Sackschewsky, M.R.; Kemp, C.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940292-1: 25. IECA annual conference and trade exposition, Reno, NC (United States), 15-18 Feb 1994). Order Number DE94016469. Source: OSTI; NTIS; INIS; GPO Dep.

The current Hanford practice for stabilizing contaminated soil sites and retired burial grounds involves placing clean soil over the surface, followed by revegetation. This procedure has resulted in the establishment of a viable plant cover at a number of locations. In other cases, however, these efforts have failed to establish healthy shallow-rooted grass coverage. The establishment of a viable plant community is inherently difficult on the Hanford Site for a variety of reasons, including inadequate and sporadic natural precipitation; windy conditions that produce large erosive forces; soils low in nutrients and organic matter; invasion of disturbed sites by aggressive, weedy annuals; and limited supplies of quality topsoil. This report describes the results of work designed to address three environmental issues (soil moisture, erosion, and soil nutrients). Compost and soil sealants were evaluated in various combinations with the expectation of developing revegetation procedures with a higher probability of success.

1890 (WHC-SD-EN-AP-159) Wellfield strategy and recommendations for the 200 West Area carbon tetrachloride expedited response action. Rohay, V.J. Westinghouse Hanford Co., Richland, WA (United States). 1 Apr 1994. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014113. Source: OSTI; NTIS; GPO Dep.

On December 20, 1990, the US Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) requested the US Department of Energy (DOE), Richland Field Office (RL) to proceed with the detailed planning, including nonintrusive field work, required to implement an Expedited Response Action (ERA) for removing carbon tetrachloride contamination in the unsaturated soils in the 200 West Area of the Hanford Site. The request was based on concerns that the carbon tetrachloride residing in the soils was continuing to spread to the groundwater and, if left unchecked, would significantly increase the area of groundwater contamination. The purpose of this ERA is to minimize carbon tetrachloride migration within the unsaturated zone beneath and away from the carbon tetrachloride disposal sites in the 200 West Area.

1891 (WHC-SD-WM-RPT-139) Subsidence evaluation in 218-E-E12B, trench 38. Streit, J.J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010050. Source: OSTI; NTIS; INIS; GPO Dep.

An area in Trench 38 of the 218-E-12B Burial Ground has been gradually sinking over the past few years. The area spans the width of the trench and extends approximately 80 feet down the trench. The depth of the depression is approximately 3 feet in the center and gradually rises to existing grade at the trench edge. It has been determined that the most likely cause of the subsidence is decomposition of buried waste material. Fifty-six percent of the waste buried in the subject area is decomposable and has been in the ground for nine years. Waste packaging is largely plastic lined dump trucks and fiberboard boxes. It is recommended

that this area be treated with dynamic compaction to stabilize the waste and minimize the reoccurrence of subsidence in this area.

1892 Transport of radioactive ions in soil by electrokinetics. Buehler, M.F. (Pacific Northwest Lab., Richland, WA (United States)); Surma, J.E.; Virden, J.W. pp. 111-126 of *Metals and materials waste reduction, recovery and remediation*. Liddell, K.C. (ed.); Bautista, R.G. (ed.); Orth, R.J. (ed.). Minerals, Metals and Materials Society, Warrendale, PA (United States) (1994). pp. 242 DOE Contract AC06-76RL01830. (CONF-941016-: Materials week '94, Rosemont, IL (United States), 3-7 Oct 1994).

An electrokinetic approach is being evaluated for in situ soil remediation at the Hanford Site in Richland, Washington. This approach uses an applied electric field to induce transport of both radioactive and hazardous waste ions in soil. The work discussed in this paper involves the development of a new method to monitor the movement of the radioactive ions within the soil during the electrokinetic process. A closed cell and a gamma counter were used to provide in situ measurements of ^{137}Cs and ^{60}Co movement in Hanford soil. Preliminary results show that for an applied potential of 200 V over approximately 200 hr, ^{137}Cs and ^{60}Co were transported a distance of 4 to 5 in. The monitoring technique demonstrated the feasibility of using electrokinetics for soil separation applications.

1893 Colloid formation during the corrosion of SRL 200 glass. Buck, E.C. (Argonne National Lab., IL (United States)); Bates, J.K.; Feng, X. pp. 187-197 of *Ceramic transactions: Environmental and waste management issues in the ceramic industry II*. Volume 45. Bickford, D.; Bates, S.; Jain, V.; Smith, G. (eds.). American Ceramic Society, Westerville, OH (United States) (1994). pp. 513 DOE Contract W-31109-ENG-38. (CONF-940416-: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994).

Nonradioactive SRL 200S glass and fully radioactive SRL 200R glass were reacted at glass surface areas to leachant volume (SA/V) ratios of 20,000 m^{-1} , 2,000 m^{-1} , and 340 m^{-1} for times varying from several days to a few years. The particles present in the leachates of these tests have been examined by analytical electron microscopy (AEM). The major colloidal clay phase was identified as a smectite clay from its characteristic electron diffraction pattern. The clay colloids eventually disappear from the solution and return to the glass; the time at which this occurs depends on the SA/V. Uranium silicate particles and calcium-bearing phases were also sometimes found in the leachates.

1894 Effects of S/V on secondary phase formation on waste glasses. Feng, X. (Argonne National Lab., IL (United States)); Buck, E.C.; Bates, J.K.; Gong, M.; Dietz, N.L.; Pegg, I.L. pp. 243-254 of *Ceramic transactions: Environmental and waste management issues in the ceramic industry II*. Volume 45. Bickford, D.; Bates, S.; Jain, V.; Smith, G. (eds.). American Ceramic Society, Westerville, OH (United States) (1994). pp. 513 DOE Contract W-31109-ENG-38. (CONF-940416-: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994).

Simulated West Valley high-level nuclear waste glass, WV205, was leached with and without buffered media in both deuterated and ordinary water at glass surface area to solution volumes (S/V) of 200-6000 m^{-1} . Examination of the glass surface after testing for 14 days indicated that the S/

V-induced pH change plays a dominant role in the development of the altered surface layer and the secondary phases formed. The changes due to S/V-induced pH determine the rate of surface layer formation, the element distribution in the surface layer, and possibly, the identities of the secondary phases. Changes due to S/V-induced elemental concentration also influence glass reaction rate in terms of the layer thickness and the elemental distribution in the surface layers.

1895 Reductive dissolution of uranium(VI) and iron(III) oxyhydroxides by dithionite and tiron. Thompson, S.L. (Fort Lewis College, Durango, CO (United States)); Logan, S.R.; Sommerville, L.E.; Palmer, T.; Hanson, A.T.; Iams, H.D.; Strietelmeier, B.A.; Brainard, J.R. pp. 318, Paper CHED 221 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The dissolution of metal oxyhydroxides has applications in many areas, including hydrometallurgy, separations, and soil decontamination. One of the most effective means to dissolve Fe and Mn oxyhydroxides involves the use of reductants to reduce the metals from a less soluble to a more soluble oxidation state (e.g., Fe(III) to Fe(II)). The authors have recently shown that a similar reductive strategy is also applicable to dissolving uranium(VI) oxyhydroxides, in the presence of a strong chelator for U(IV), which prevents U(IV) hydrolysis and precipitation. The authors have compared the concentration dependence of dissolution of U(VI) and Fe(III) oxyhydroxide phases by dithionite and Tiron (1,2-dihydroxy-3,5-benzenedisulfonic acid) to evaluate the similarities and differences in dissolution mechanisms for these two oxyhydroxides.

1896 Binding studies of desferrioxamine-B with lanthanide and actinide ions. Ford, D.K. (Los Alamos National Lab., NM (United States)); Caswell, W.A.; Smith, P.H.; Brainard, J.R.; Strietelmeier, E.A.; Newton, T.W. pp. 801, Paper INOR 70 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Desferrioxamine-B (DFB) is among the class of naturally occurring chelators known as siderophores. It has been widely studied due to its high affinity for hard oxophilic metal ions. The authors present binding constant studies of DFB with selected lanthanide and actinide ions as determined by potentiometric and spectrophotometric titration.

1897 Heat transfer within a concrete slab with a finite microwave heating source. Lagos, L.E. (Florida International Univ., Miami, FL (United States). Dept. of Mechanical Engineering); Li, W.; Ebadian, M.A.; Grubb, R.G.; White, T.L.; Foster, D. *International Journal of Heat and Mass Transfer (United Kingdom)*; 38(5): 887-897 (Mar 1995).

In the present paper, the concrete decontamination and decommissioning process with a finite microwave heating source is investigated theoretically. For the microwave induced heating pattern, a multilayer concrete slab, which includes steel reinforcement mesh, is assumed to be exposed to a finite plane microwave source at normal incidence. Two-dimensional heat transport within the concrete is also considered to evaluate the variations of temperature with heating time at different frequencies with and without the

presence of the reinforcement bars. Four commonly used industrial microwave frequencies of 0.896, 2.45, 10.6 and 18.0 GHz have been selected. The results revealed that as the microwave frequency increases to, or higher than 10.6 GHz, the maximum temperature shifts toward the front surface of the concrete. It was found that the presence of a steel reinforcement mesh causes part of the microwave energy to be blocked and reflected. Furthermore, it was observed that the temperature distribution is nearly uniform within the dimensions of the microwave applicator for a high microwave power intensity and a short heating time. (author).

1898 Comparison of shuffler and differential die-away technique instruments for the assay of fissile materials in 55-gallon waste drums. Rinard, P.M. (Los Alamos National Lab., NM (United States)); Coop, K.L.; Nicholas, N.J.; Menlove, H.O. *JNMM (Journal of the Institute of Nuclear Materials Management) (United States)*; 22(4): 28-38 (Jul 1994).

The authors compare the features of a ^{252}Cf shuffler and a differential die-away technique (DDT) instrument for the assay of 208-L (55-gal.) waste drums and the experimental results obtained using drums with 20 different simulated waste matrices. Active assays of uranium and plutonium were made, along with passive assays of plutonium. The major potential sources of inaccuracy for most wastes are self-shielding and nonuniform distribution of the fissile material throughout a drum's volume. They examined the distribution problem by placing small samples of plutonium and uranium at 15 representative locations within each test matrix. The combined responses from all these locations simulated the case of a uniform distribution. Inaccuracies can grow as the density of moderator or absorber in a matrix is increased, so a wide range of absorber and moderator densities was used in the test drums. Self-shielding and effects due to high-neutron backgrounds were also examined. The instruments' minimum detectable masses for uniform distributions of uranium and plutonium were calculated for the various matrices.

1899 Experimental study of the transition from the slab to the toroidal branch of the ion temperature gradient mode. Chen, J. (Plasma Physics Laboratory, Columbia University, New York, New York 10027 (United States)); Sen, A.K. *Physical Review Letters (United States)*; 72(25): 3997-4000 (20 Jun 1994). DOE Contract FG02-87ER53257.

The transition from the slab to the toroidal branch of the ion temperature gradient (ITG) mode was studied by first exciting the slab (ITG) mode and gradually raising the magnetic curvature in the Columbia Linear Machine. Modest levels of magnetic curvature destabilized and reduced the real frequency of the mode in accordance with the prediction from a simple theory. However, with further increase in mirror ratio and trapped particles, the observed mode amplitude decreased and the parallel wavelength greatly increased. This may be a hybrid ITG dissipative trapped electron mode.

1900 Heat and mass transfer in a contaminated porous concrete slab with variable dielectric properties. Li, W. (Florida International Univ., Miami, FL (United States). Dept. of Mechanical Engineering); Ebadian, M.A.; White, T.L.; Grubb, R.G.; Foster, D. *International Journal of Heat and Mass Transfer (United Kingdom)*; 37(6): 1013-1027 (Apr 1994).

The effect of temperature dependent dielectric properties on concrete decontamination and decommissioning using

microwave technology is investigated theoretically in this paper. The concrete is treated as a porous material, which has residual water and air within the pores. A one-dimensional model of unsteady heat and mass transport in the porous concrete with temperature dependent dielectric properties is developed. Based on this model, temperature and pressure with different microwave frequencies are predicted, the effects of the temperature dependent dielectric properties on microwave power dissipation, the temperature and pressure distributions for different microwave frequencies, and the different microwave power intensities are analyzed in detail. Four available industrial microwave frequencies of 0.896, 2.45, 10.6 and 18.0 GHz are used in the analysis. As a result of the dielectric properties varying with temperature, the power dissipation also varies with the heating times. Comparing the results for both temperature dependent and constant dielectric properties reveals that the variation of dielectric permittivity with temperature must be considered in a theoretical model of the concrete decontamination and decommissioning process for a low microwave frequency (<2.45 GHz). (Author).

1901 Permeability and microstructure of plain and polypropylene fiber reinforced grouts. Allan, M.L. (Brookhaven National Lab., Upton, NY (United States). Energy Efficiency and Conservation Div.); Kukacka, L.E. *Cement and Concrete Research (United States)*; 24(4): 671-681 (1994).

The chemical waste landfill at Sandia National Laboratories in New Mexico is to be remediated as part of the Mixed Waste Landfill Integrated Demonstration sponsored by the US Department of Energy. The major concern at this landfill is detected migration chromic acid and chromic sulfuric acid solutions were disposed. It is planned to stabilize chromium, place low permeability vertical and horizontal subsurface barriers for containment and finally, cap the landfill. The aim of the remediation is to reduce chromium migration to environmentally acceptable levels in a cost-effective manner. Cementitious grouts with and without polypropylene fibers were evaluated for use as containment barriers around waste landfills located in an arid environment. Viscosity, flow time, water permeability and microstructure of the grouts were investigated. Low permeabilities of the order of 10^{-11} to 10^{-10} cm/s were measured on cement-sand grouts. Permeability was influenced by curing conditions and water/cement ratio. Variation of sand/cement ratio by mass from 1 to 1.2 and addition of 0.1 to 0.2% volume fraction fibers did not affect permeability significantly.

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Refer also to citation(s) 100

1902 (ANL-94/10) Argonne National Laboratory-East site environmental report for calendar year 1993. Golchert, N.W. (Argonne National Lab., IL (United States). Environment and Waste Management Program); Kolzow, R.G. Argonne National Lab., IL (United States). May 1994. 295p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001080. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the results of the environmental protection program at Argonne National Laboratory-East (ANL)

for 1993. To evaluate the effects of ANL operations on the environment, samples of environmental media collected on the site, at the site boundary, and off the ANL site were analyzed and compared to applicable guidelines and standards. A variety of radionuclides was measured in air, surface water, groundwater, soil, grass, and bottom sediment samples. In addition, chemical constituents in surface water, groundwater, and ANL effluent water were analyzed. External penetrating radiation doses were measured and the potential for radiation exposure to off-site population groups was estimated. The results of the surveillance program are interpreted in terms of the origin of the radioactive and chemical substances (natural, fallout, ANL, and other) and are compared with applicable environmental quality standards. A US Department of Energy (DOE) dose calculation methodology, based on International Commission on Radiological Protection (ICRP) recommendations and the CAP-88 version of the EPA-AIRDOSE/RAD RISK computer code, is used in this report. The status of ANL environmental protection activities with respect to the various laws and regulations which govern waste handling and disposal is discussed. This report also discusses progress being made on environmental corrective actions and restoration projects from past activities.

1903 (ANL/EA/CP-82216) Insights on radiological risks of US Department of Energy radioactive waste management alternatives in the Environmental Management Programmatic Environmental Impact Statement. Mueller, C. Argonne National Lab., IL (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941142-29: American Society of Mechanical Engineers' winter annual meeting, Chicago, IL (United States), 6-11 Nov 1994). Order Number DE95005865. Source: OSTI; NTIS; INIS; GPO Dep.

A Facility Accident Analysis (1) was performed in support of the US Department of Energy (DOE) Environmental Management (EM) Programmatic Environmental Impact Statement (PEIS). It used an integrated risk-based approach (2) to allow risk comparisons of EM PEIS strategies for consolidating the storage and treatment of wastes at different DOE sites throughout the country. This approach was developed in accordance with the latest National Environmental Protection Act (NEPA) compliance guidance from DOE (3), which calls for consideration of a spectrum of accident scenarios that could occur in implementing the various actions evaluated in the EM PEIS. This paper discusses our insights with respect to the likely importance of the relative treatment technologies, waste management facilities and operations, and waste consolidation strategies considered in the EM PEIS.

1904 (ANL/EA/CP-83307) Recycling of radioactively contaminated materials: Public policy issues. Hocking, E.K. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940798-1: Radioactive scrap metal conference, Knoxville, TN (United States), 12-14 Jul 1994). Order Number DE94015094. Source: OSTI; NTIS; INIS; GPO Dep.

Recycling radioactively contaminated materials requires varying degrees of interaction among Federal regulatory agencies such as the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA), State governments and regulators, the public, and the Department of Energy. The actions of any of these parties can elicit reactions from the other parties and will raise issues

that must be addressed in order to achieve a coherent policy on recycling. The paper discusses potential actions and reactions of Federal regulatory agencies (defined as NRC and EPA), the States, and the Department and the policy issues they raise.

1905 (ANL/EA/CP-83690) Limiting human exposures through the "as low as reasonably achievable" process at a Department of Energy mixed waste site. MacDonell, M.; Peterson, J.; Haroun, L.; Blunt, D.; Dunning, D. Argonne National Lab., IL (United States). Environmental Assessment Div. [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9408151-2: Dixy Lee Ray memorial symposium on science-based environmental management, Seattle, WA (United States), 30 Aug - 2 Sep 1994). Order Number DE94018354. Source: OSTI; NTIS; INIS; GPO Dep.

Applying a process to reduce human exposures to levels as low as reasonably achievable (ALARA) is a cornerstone of the US Department of Energy's radiation protection program, and this process is being used to develop cleanup levels for contaminated sites across the country. Under the ALARA process, exposures and risks are reduced as far below protective criteria as can reasonably be achieved—considering technical, economic, and social factors. Risk-based cleanup levels have been developed for radionuclides and chemicals in surface water and soil at the Weldon Spring site in Missouri, following explicit applications of the ALARA process. Among the lessons learned during these applications were the importance of three factors: (1) soliciting early input from the parties involved—because the ALARA process involves a range of technical and nontechnical issues; (2) maintaining site specificity for the ALARA analyses—because contaminant types and distributions will vary, as will local conditions and constraints; and (3) identifying cleanup levels in the planning phase that are distinct from those developed for the field phase—because remedies can be over-designed if the decision levels are the same as the ALARA goals for field work, such that little increased risk reduction is achieved for substantially higher costs.

1906 (ANL/EA/CP-84148) Radiological accidents potentially important to human health risk in the U.S. Department of Energy waste management program. Mueller, C. (Argonne National Lab., IL (United States)); Roglans-Ribas, J.; Folga, S.; Nabelssi, B.; Jackson, R. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-109: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95008292. Source: OSTI; NTIS; INIS; GPO Dep.

Human health risks as a consequence of potential radiological releases resulting from plausible accident scenarios constitute an important consideration in the US Department of Energy (DOE) national program to manage the treatment, storage, and disposal of wastes. As part of this program, the Office of Environmental Management (EM) is currently preparing a Programmatic Environmental Impact Statement (PEIS) that evaluates the risks that could result from managing five different waste types. This paper (1) briefly reviews the overall approach used to assess process and facility accidents for the EM PEIS; (2) summarizes the key inventory, storage, and treatment characteristics of the various DOE waste types important to the selection of accidents; (3)

discusses in detail the key assumptions in modeling risk-dominant accidents; and (4) relates comparative source term results and sensitivities.

1907 (ANL/EA/CP-84160) Accident analysis for transuranic waste management alternatives in the U.S. Department of Energy waste management program. Nabelssi, B. (Argonne National Lab., IL (United States)); Mueller, C.; Roglans-Ribas, J.; Folga, S.; Tompkins, M.; Jackson, R. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-104: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008286. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary accident analyses and radiological source term evaluations have been conducted for transuranic waste (TRUW) as part of the US Department of Energy (DOE) effort to manage storage, treatment, and disposal of radioactive wastes at its various sites. The approach to assessing radiological releases from facility accidents was developed in support of the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS). The methodology developed in this work is in accordance with the latest DOE guidelines, which consider the spectrum of possible accident scenarios in the implementation of various actions evaluated in an EIS. The radiological releases from potential risk-dominant accidents in storage and treatment facilities considered in the EM PEIS TRUW alternatives are described in this paper. The results show that significant releases can be predicted for only the most severe and extremely improbable accidents sequences.

1908 (ANL/EA/CP-84167) Case study: Evaluation of a scenario for the reuse of structures in the production area at Fernald. Davis, M.J. (Argonne National Lab., IL (United States)); Folga, S.; Janke, R.J.; Kozlowski, D.R. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-99: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008279. Source: OSTI; NTIS; INIS; GPO Dep.

The potential for the reuse of uncontaminated structures at federal facilities that are being remediated should be evaluated. Although various factors often limit the viability of such reuse, it may be economically attractive to reuse selected structures. Consideration of a hypothetical reuse scenario for the US Department of Energy's Fernald, Ohio facility shows that the reuse of selected buildings that were not significantly contaminated by production activities at the site may be considerably less expensive than the construction of new ones. The cost of removal of existing buildings is a major factor influencing the relative advantages of these two options. For Fernald, no need for the facility's buildings has been identified; however, the reuse of structures may be a viable option at other facilities.

1909 (ANL/EA/CP-84292) Development of risk-based computer models for deriving criteria on residual radioactivity and recycling. Chen, S.Y. (Argonne National Lab., IL (United States). Environmental Assessment Division). Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9411165-1: 2. workshop on residual radioactivity and recycling

criteria, Tokai (Japan), 9-11 Nov 1994). Order Number DE95004650. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory (ANL) is developing multimedia environmental pathway and health risk computer models to assess radiological risks to human health and to derive cleanup guidelines for environmental restoration, decommissioning, and recycling activities. These models are based on the existing RESRAD code, although each has a separate design and serves different objectives. Two such codes are RESRAD-BUILD and RESRAD-PROBABILISTIC. The RESRAD code was originally developed to implement the US Department of Energy's (DOE's) residual radioactive materials guidelines for contaminated soils. RESRAD has been successfully used by DOE and its contractors to assess health risks and develop cleanup criteria for several sites selected for cleanup or restoration programs. RESRAD-BUILD analyzes human health risks from radioactive releases during decommissioning or rehabilitation of contaminated buildings. Risks to workers are assessed for dismantling activities; risks to the public are assessed for occupancy. RESRAD-BUILD is based on a room compartmental model analyzing the effects on room air quality of contaminant emission and resuspension (as well as radon emanation), the external radiation pathway, and other exposure pathways. RESRAD-PROBABILISTIC, currently under development, is intended to perform uncertainty analysis for RESRAD by using the Monte Carlo approach based on the Latin-Hypercube sampling scheme. The codes being developed at ANL are tailored to meet a specific objective of human health risk assessment and require specific parameter definition and data gathering. The combined capabilities of these codes satisfy various risk assessment requirements in environmental restoration and remediation activities.

1910 (ANL/EA/CP-85630) Computational framework and database for accident analyses of Waste Management alternatives in the US Department of Energy Waste Management Program. Tompkins, M.; Novickas, A.; Nabelssi, B.; Roglans-Ribas, J.; Folga, S.; Mueller, C. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-131: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95010849. Source: OSTI; NTIS; INIS; GPO Dep.

The first section of this report describes the methodology and computational framework for the facility accident analysis for the EM PEIS. To demonstrate the interaction of the modules, a sample calculation is presented along with a chart of the data flows; the example involves a general handling accident involving one 55-gal drum containing ER-generated LLW. General handling accidents (e.g., drops, spill of container or punctures by forklift) are expected to dominate the radiological and chemical risk to the work force. Tables of example output files present the calculation of the product of source term factors and the unit-risk conversion factor, and the partial accident sequence annual probability for classes of waste processing activity and accident release.

1911 (ANL/EAD/LD-2) Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0. Yu, C. (and others); Zielen, A.J.; Cheng, J.J. Argonne National Lab., IL (United States). Sep 1993. 334p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94015594. Source: OSTI; NTIS; INIS; GPO Dep.

This manual presents information for implementing US Department of Energy (DOE) guidelines for residual radioactive material. It describes the analysis and models used to derive site-specific guidelines for allowable residual concentrations of radionuclides in soil and the design and use of the RESRAD computer code for calculating doses, risks, and guideline values. It also describes procedures for implementing DOE policy for reducing residual radioactivity to levels that are as low as reasonably achievable. Two new pathways, radon inhalation and soil ingestion, have been added to RESRAD. Twenty-seven new radionuclides have also been added, and the cutoff half-life for associated radionuclides has been reduced to six months. Other major improvements to the RESRAD code include the ability to run sensitivity analyses, the addition of graphical output, user-specified dose factors, updated databases, an improved groundwater transport model, optional input of a groundwater concentration and a solubility constant, special models for tritium and carbon-14, calculation of cancer incidence risk, and the use of a mouse with menus.

1912 (ANL/EAD/TM-24) RESRAD benchmarking against six radiation exposure pathway models. Faillace, E.R.; Cheng, J.J.; Yu, C. Argonne National Lab., IL (United States). Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95003096. Source: OSTI; NTIS; INIS; GPO Dep.

A series of benchmarking runs were conducted so that results obtained with the RESRAD code could be compared against those obtained with six pathway analysis models used to determine the radiation dose to an individual living on a radiologically contaminated site. The RESRAD computer code was benchmarked against five other computer codes - GENII-S, GENII, DECOM, PRESTO-EPA-CPG, and PATHRAE-EPA - and the uncodified methodology presented in the NUREG/CR-5512 report. Estimated doses for the external gamma pathway; the dust inhalation pathway; and the soil, food, and water ingestion pathways were calculated for each methodology by matching, to the extent possible, input parameters such as occupancy, shielding, and consumption factors.

1913 (ANL/EAD/TM-33) Derivation of uranium residual radioactive material guidelines for the 4400 Piehl Road Site, Ottawa Lake, Michigan. Faillace, E.; Nimmagadda, M.; Yu, C. Argonne National Lab., IL (United States). Dec 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95004186. Source: OSTI; NTIS; INIS; GPO Dep.

Residual radioactive material guidelines for uranium were derived for the 4400 Piehl Road site in Ottawa Lake, Michigan. This site has been designated for remedial action under the Formerly Utilized Sites Remedial Action Program (FUSRAP) of the US Department of Energy (DOE). Single nuclide and total uranium guidelines were derived on the basis of the requirement that the 50-year committed effective dose equivalent to a hypothetical individual who lives or works in the immediate vicinity of the 4400 Piehl Road site should not exceed 30 mrem/yr following remedial action for the current use and plausible future use scenarios. The DOE residual radioactive material guideline computer code, RESRAD, which applies the methodology described in the DOE manual for implementing residual radioactive material guidelines, was used in this evaluation.

1914 (ANL/EAD/TM-34) Derivation of residual radioactive material guidelines for 13 radionuclides

present in Operable Unit IV at Brookhaven National Laboratory, Upton, New York. Faillace, E.; Nimmagadda, M.; Yu, C. Argonne National Lab., IL (United States). Environmental Assessment Div. Dec 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95004273. Source: OSTI; NTIS; INIS; GPO Dep.

Residual radioactive material guidelines for 13 radionuclides (americium-241; cobalt-60; cesium-137; europium-152, -154, and -155; plutonium-238, -239, and -240; strontium-90; and uranium-234, -235, and -238) were derived for Operable Unit (OU) IV at Brookhaven National Laboratory. This site has been identified for remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986. Single-nuclide guidelines were derived on the basis of the requirement that the 50-year committed effective dose equivalent to a hypothetical individual who lives or works in the immediate vicinity of OU IV should not exceed a dose constraint of 30 mrem/yr following remedial action for the current use and plausible future use scenarios or a dose limit of 100 mrem/yr for plausible but less likely future use scenarios. The US Department of Energy (DOE) residual radioactive material guideline computer code, RESRAD, was used in this evaluation; RESRAD implements the methodology described in the DOE manual for determining residual radioactive material guidelines. Four potential scenarios were considered; each assumed that, for a period of 1,000 years following remedial action, the site would be used without radiological restrictions. The four scenarios varied with regard to the type of site use, time spent at the site, and sources of food consumed.

1915 (ANL/EAD/TM-37) Derivation of residual radioactive material guidelines for uranium in soil at the Former Associate Aircraft Tool and Manufacturing Company Site, Fairfield, Ohio. Faillace, E.R.; Nimmagadda, M.; Yu, C. Argonne National Lab., IL (United States). Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007629. Source: OSTI; NTIS; INIS; GPO Dep.

Residual radioactive material guidelines for uranium in soil were derived for the former Associate Aircraft Tool and Manufacturing Company site in Fairfield, Ohio. This site has been identified for remedial action under the U.S. Department of Energy's (DOE's) Formerly Utilized Sites Remedial Action Program (FUSRAP). Single-nuclide and total-uranium guidelines were derived on the basis of the requirement that, after remedial action, the 50-year committed effective dose equivalent to a hypothetical individual living or working in the immediate vicinity of the site should not exceed (1) 30 mrem/yr for the current-use and likely future-use scenarios or (2) 100 mrem/yr for less likely future-use scenarios. The DOE residual radioactive material (RESRAD) computer code, which implements the methodology described in the DOE manual for establishing residual radioactive material guidelines, was used in this evaluation.

1916 (ANL/EWM/CP-83384) Decontamination and dismantlement of the Argonne National Laboratory-East Map Tube Facility. Moos, L.P. (Argonne National Lab., IL (United States)); Wescott, J.B.; Fleming, D.L.; Subbaraman, G.; Horton, P. Argonne National Lab., IL (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941196-2: 2. ANS workshop on the safety of Soviet-designed

nuclear power plants in conjunction with the winter meeting of the American Nuclear Society, Washington, DC (United States), 12-13 Nov 1994). Order Number DE95004652. Source: OSTI; NTIS; INIS; GPO Dep.

The Map Tube Facility at Argonne National Laboratory-East (ANL-E) was used to temporarily store small, highly radioactive objects and waste materials. The facility contained 129 cast-iron pipes set vertically in a 21 feet deep concrete monolithic structure. Deterioration of the unit allowed water to enter the pipes, carrying radioactive materials into surrounding soil and groundwater. Radioactive sediment and numerous small metallic objects were found in the pipes. Decontamination was undertaken to remove the radioactive water and sediment. The highly radioactive metallic objects were removed and characterized. Residual radioactivity was removed from the structure by removing each pipe from the concrete matrix through a deep concrete coring operation. Each 21 foot long pipe was removed from the concrete matrix as a single unit, lead in two joints in each pipe was removed and the cores were shipped to the DOE Hanford site for disposal. The coring operation successfully removed all residual radioactive material from the structure.

1917 (ANL/TD/RP-85215) Status report on the Experimental Boiling Water Reactor (EBWR) Decontamination and Decommissioning (D&D) Project. Sears, L. (ALARON Corp., Cayce, SC (United States)); Garlock, G.; Mencarelli, R.; Fellhauer, C. Argonne National Lab., IL (United States); ALARON Corp., Cayce, SC (United States). 15 Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009911. Source: OSTI; NTIS; INIS; GPO Dep.

ALARON Corporation is under contract, to Argonne National Laboratory - East (ANL-E), to complete the decontamination and decommissioning of the Experimental Boiling Water Reactor (EBWR). The project, begun, in 1986 by ANL-E personnel, is projected to be completed by the end of 1994. The final phase of work was awarded to ALARON in December 1993 with the scope of work including the disassembly and removal of all remaining reactor internals, the reactor vessel, the lead bio-shield, the core liner, and the activated portion of the concrete bio-shield. This paper discusses the work undertaken beginning in January 1994 and continuing through July 1994. During this period the required pre-mobilization documentation was prepared and approved, mobilization was completed, and the reactor internals, reactor vessel, lead bio-shield and core liner were removed. The paper will compare the planned schedule to the actual schedule, discuss problems encountered, review volume reduction techniques and health and safety issues including radiological aspects of the project.

1918 (BNL-60842) Uncertainties in risk assessment at USDOE facilities. Hamilton, L.D.; Holtzman, S.; Meinhold, A.F.; Morris, S.C.; Rowe, M.D. Brookhaven National Lab., Upton, NY (United States). Jan 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95000761. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (USDOE) has embarked on an ambitious program to remediate environmental contamination at its facilities. Decisions concerning cleanup goals, choices among cleanup technologies, and funding prioritization should be largely risk-based. Risk assessments will be used more extensively by the USDOE in the future. USDOE needs to develop and refine risk assessment methods and fund research to reduce major sources

of uncertainty in risk assessments at USDOE facilities. The terms 'risk assessment' and 'risk management' are frequently confused. The National Research Council (1983) and the United States Environmental Protection Agency (USEPA, 1991a) described risk assessment as a scientific process that contributes to risk management. Risk assessment is the process of collecting, analyzing and integrating data and information to identify hazards, assess exposures and dose responses, and characterize risks. Risk characterization must include a clear presentation of "... the most significant data and uncertainties..." in an assessment. Significant data and uncertainties are "...those that define and explain the main risk conclusions". Risk management integrates risk assessment information with other considerations, such as risk perceptions, socioeconomic and political factors, and statutes, to make and justify decisions. Risk assessments, as scientific processes, should be made independently of the other aspects of risk management (USEPA, 1991a), but current methods for assessing health risks are based on conservative regulatory principles, causing unnecessary public concern and misallocation of funds for remediation.

1919 (CAPE-3085) Oak Ridge National Laboratory remedial investigation/feasibility study: Building 3515 existing conditions exterior elevations [Engineering Materials]. Bechtel Environmental, Inc., Oak Ridge, TN (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Source: OSTI.

2 Drawings. These drawings accompany report no. ORNL/ER/Sub-87-99053/73.

Building 3515 at Oak Ridge National Laboratory (ORNL), also known as the Fission Product Pilot Plant, is a surplus facility in the main plant area to the east of the South Tank Farm slated for decontamination and decommissioning (D&D). The building consists of two concrete cells (north and south) on a concrete pad and was used to extract radioisotopes of ruthenium, strontium, cesium, cerium, rhenium and other elements from aqueous fission product waste. Site characterization activities of the building were initiated. The objective of the site characterization was to provide information necessary for engineering evaluation and planning of D&D approaches, planning for personal protection of D&D workers, and estimating waste volumes from D&D activities. This site characterization report documents the investigation with a site description, a summary of characterization methods, chemical and radiological sample analysis results, field measurement results, and waste volume estimates. This reference contains only drawings of the 3515 building.

1920 (CONF-9304128-24) A case study on determining air monitoring requirements in a radioactive materials handling area. Newton, G.J. (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States)); Bechtold, W.E.; Hoover, M.D.; Ghanbari, F.; Herring, P.S.; Jow, Hong-Nian. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. Order Number DE95006164. Source: OSTI; NTIS; INIS; GPO Dep.

A technical, defensible basis for the number and placement of air sampling instruments in a radioactive materials handling facility was developed. Historical air sampling data, process and physicochemical knowledge, qualitative smoke

dispersion studies with video documentation, and quantitative trace gas dispersion studies were used to develop a strategy for number and placement of air samplers. These approaches can be used in other facilities to provide a basis for operational decisions. The requirements for retrospective sampling, personal sampling, and real-time monitoring are included. Other relevant operational decisions include selecting the numbers, placement, and appropriate sampling rates for instruments, identifying areas of stagnation or recirculation, and determining the adequacy and efficiency of any sampling transport lines. Justification is presented for using a graded approach to characterizing the workplace and determining air sampling and monitoring needs.

1921 (CONF-940406-13) Microwave concrete decontamination - Phase II results. White, T.L.; Foster, D. Jr. Oak Ridge National Lab., TN (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on decontamination and decommissioning; Knoxville, TN (United States); 27-29 Apr 1994. Order Number DE94013269. Source: OSTI; NTIS; GPO Dep.

This report documents the results of the second phase of a four-phase development program to develop a system to decontaminate concrete using microwave energy. In the first phase of the program the feasibility of using microwaves to remove concrete surfaces was demonstrated. In the first phase experiments, concrete slabs were placed on a translator and moved beneath a stationary microwave system. The second phase demonstrated the ability to mobilize the technology to remove the surfaces from concrete floors. Phases III and IV will further develop the technology to be remotely operated and capable of removing concrete from floors as well as from vertical surfaces.

1922 (CONF-940809-6) Temperature and pore pressure distribution in a concrete slab during the microwave decontamination process. Li, W. (Florida International Univ., Miami, FL (United States). Dept. of Mechanical Engineering); Ebadian, M.A.; White, T.L.; Grubb, R.G.; Foster, D. Jr. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 10. International heat transfer conference; Brighton (United Kingdom); 14-18 Aug 1994. Order Number DE95000487. Source: OSTI; NTIS; GPO Dep.

As an application of microwave engineering, the new technology of concrete decontamination and decommissioning using microwave energy has been recently developed. The temperature and pore pressure within the concrete are studied theoretically in this paper. The heat and mass transfer within the porous concrete, coupled with temperature dependent dielectric property are investigated. The effects of microwave frequency (f), microwave power intensity ($Q_{0,ave}$), concrete porosity (ϕ) on the temperature and pore pressure distributions and their variations are fully discussed. The effects of the variation of complex dielectric permittivity (ϵ) and presentation of different steel reinforcements are also illustrated.

1923 (CONF-950216-53) Development of an auditable safety analysis in support of a radiological facility classification. Kinney, M.D. (Roy F. Weston, Inc., Rockville, MD (United States)); Young, B. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC04-91AL62350. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95007617. Source: OSTI; NTIS; INIS; GPO Dep.

In recent years, U.S. Department of Energy (DOE) facilities commonly have been classified as reactor, non-reactor nuclear, or nuclear facilities. Safety analysis documentation was prepared for these facilities, with few exceptions, using the requirements in either DOE Order 5481.1B, Safety Analysis and Review System; or DOE Order 5480.23, Nuclear Safety Analysis Reports. Traditionally, this has been accomplished by development of an extensive Safety Analysis Report (SAR), which identifies hazards, assesses risks of facility operation, describes and analyzes adequacy of measures taken to control hazards, and evaluates potential accidents and their associated risks. This process is complicated by analysis of secondary hazards and adequacy of backup (redundant) systems. The traditional SAR process is advantageous for DOE facilities with appreciable hazards or operational risks. SAR preparation for a low-risk facility or process can be cost-prohibitive and quite challenging because conventional safety analysis protocols may not readily be applied to a low-risk facility. The DOE Office of Environmental Restoration and Waste Management recognized this potential disadvantage and issued an EM limited technical standard, No. 5502-94, Hazard Baseline Documentation. This standard can be used for developing documentation for a facility classified as radiological, including preparation of an auditable (defensible) safety analysis. In support of the radiological facility classification process, the Uranium Mill Tailings Remedial Action (UMTRA) Project has developed an auditable safety analysis document based upon the postulation criteria and hazards analysis techniques defined in DOE Order 5480.23.

1924 (DOE/AL/62350-24F-Attach.3-App.B) Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site, Maybell, Colorado: Appendixes to Attachment 3: Appendix A, Hydrological services calculations; Appendix B, Ground water quality by location, Final report. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1994. 378p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018532. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains chemical analysis data for ground water for the following: elements; cyanides; chlorides; dissolved organic carbon; fluorides; silica; sulfates; sulfides; dissolved solids; nitrates; and nitrites.

1925 (DOE/EA-0984-Draft-B) Environmental assessment for the deactivation of the N reactor facilities. Draft B. Mihalik, L.A. Bechtel National, Inc., Richland, WA (United States). Dec 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008216. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) needs to place the N Reactor facilities in a condition that enhances worker safety and environmental protection and reduces the costs of surveillance and maintenance. Current conditions at the N Reactor facilities, if left as they are, present a potential threat of an environmental release or exposure to workers who maintain and monitor the facilities. The current conditions are also likely to require increased surveillance and maintenance costs in the future.

1926 (DOE/EM-0178) Cost quality management assessment: DOE field handbook: Revision 3. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. 1 Jul 1994. 205p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017502. Source: OSTI; NTIS; GPO Dep.

The Field Handbook is structured around the functions that directly address or influence cost-estimating and cost-management practices: (1) Cost- and Schedule-Estimating Process; (2) Independent Cost Reviews; (3) Indirect Cost Analysis; and (4) Management and Technical Evaluation. Performance Objectives and Criteria (POCs), derived from DOE Orders, Procedures, and Standards; other Federal regulations (e.g., Federal Acquisition Regulation); and generally accepted cost-management practices, were developed for each of the functions. The intent of the POCs has not changed. The Field Handbook contains the following appendices: Appendix A: POC Cross-Walks; Appendix B: Independent Cost Review Handbook; Appendix C: Required Administrative Information; Appendix D: Team Members; Appendix E: Senior Management Support Group; Appendix F: Glossary; Appendix G: Acronyms and Abbreviations.

1927 (DOE/EM-0179) Cost Quality Management Assessment for the Fernald Environmental Management Project: Final report. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Aug 1994. 114p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018420. Source: OSTI; NTIS; GPO Dep.

The Office of Engineering and Cost Evaluation (EM-24) conducted a Cost Quality Management Assessment (CQMA) at the Fernald Environmental Management Project (FEMP) on July 15-26, 1991. The CQMA Team, composed of subject specialists from the Department of Energy (DOE) and the private sector used performance objectives and criteria (POCs) to assess the state of cost-management activities at FEMP. The operating structure at FEMP has changed significantly since 1991 when FEMP was a production site served by a Management & Operations (M&O) contractor. FEMP is now a remediation site and served by the Fernald Environmental Restoration Management Corporation (FERMCO). In addition to this major transition from a production to a restoration site, functions at FEMP that had been under the aegis of the Oak Ridge Operations Office are being transferred to the newly formed Ohio Field Office in Miamisburg, Ohio (Mound). The FEMP Round 2 CQMA, conducted March 14-25, 1994, served to review FEMP's cost and cost-related management practices against POCs contained in the CQMA Site Handbook (Rev. 2). The interviews and document reviews conducted by the CQMA Team show that FEMP has made significant and commendable progress when measured against the POCs. Of the 58 POCs FEMP meets 30, partially meets 20, and does not meet only 8.

1928 (DOE/EM-0180) Cost Quality Management Assessment for the Nevada Operations Office: Final report. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Aug 1994. 99p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018419. Source: OSTI; NTIS; GPO Dep.

The Office of Engineering and Cost Evaluation (EM-24, now the Office of Engineering and Cost Management) conducted a Cost Quality Management Assessment (CQMA) at

DOE Nevada Operations Office (DOE-NV) on August 15-29, 1991. The CQMA team, composed of subject specialists from the DOE, other Federal agencies, and the private sector found the Nevada Test Site generally adhered to the Performance Objectives and Criteria (POCs) that addressed managing the scope of work of EM activities and to those that addressed cost- and schedule-estimating responsibilities. The team also found that the technical quality objectives of EM activities, defined in project-planning documents, were appropriate. In brief, the team found many commendable cost and cost-related management practices.

1929 (DOE/EM-0181) Phase 2 cost quality management assessment report for the Office of Technology Development (EM-50). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Aug 1994. 69p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017503. Source: OSTI; NTIS; GPO Dep.

The Office of Environmental Management (EM) Headquarters (HQ) Cost Quality Management Assessment (CQMA) evaluated the practices of the Office of Technology Development (EM-50). The CQMA reviewed EM-50 management documents and reported results in the HQ CQMA Phase 1 report (March 1993). In this Assessment Phase, EM-50 practices were determined through interviews with staff members. The interviews were conducted from the end of September through early December 1993. EM-50 management documents (Phase 1) and practices (Phase 2) were compared to the Performance Objectives and Criteria (POCs) contained in the DOE/HQ Cost Quality Management Assessment Handbook. More detail on the CQMA process is provided in section 2. Interviewees are listed in appendix A. Documents reviewed during Phase 2 are listed in appendix B. Section 3 contains detailed observations, discussions, and recommendations. A summary of observations and recommendations is presented.

1930 (DOE/EM-0193) Cost Quality Management Assessment for the Chicago Operations Office: Final report. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Aug 1994. 124p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001710. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Engineering and Cost Evaluation (EM-24, now the Office of Engineering and Cost Management) conducted a Cost Quality Management Assessment (CQMA) at the Department of Energy (DOE) Chicago Operations Office (DOE-CH) on December 9-20, 1991. The CQMA team, composed of specialist from the Department of Energy, other Federal agencies, and the private sector used Performance objectives and Criteria (POCs) to assess the state of cost-management activities at DOE-CH. The Round II CQMA was conducted June 6-17, 1994, to examine DOE-CH's progress against its Action Plan and to review DOE-CH's cost and cost-related management practices against the POCs in the CQMA Site Handbook (Rev. 2). The interviews and document reviews conducted by CQMA team members show that DOE-CH has made commendable progress when practice is measured against the POCs. Of the 48 POCs discussed in this document, DOE-CH met 13 (28 %), partially met 32 (66 %), and did not meet only 3 (6 %). Noteworthy accomplishments at DOE-CH and the Argonne National Laboratory-East (ANL-E) include: (1) Preparation of an ANL-E CQMA Self-Assessment; (2) Development of

the Argonne National Laboratory Project Management Manual; (3) Development of a corporate culture that recognizes the realities of cost and schedule constraints.

1931 (DOE/EM-0197) Guidance for establishment and implementation of field sample management programs in support of EM environmental sampling and analysis activities. National Cold Fusion Inst., Salt Lake City, UT (United States). 18 Feb 1994. 12p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004245. Source: OSTI; NTIS; INIS; GPO Dep.

The role of the National Sample Management Program (NSMP) proposed by the Department of Energy's Office of Environmental Management (EM) is to be a resource for EM programs and for local Field Sample Management Programs (FSMPs). It will be a source of information on sample analysis and data collection within the DOE complex. The purpose of this document is to establish the suggested scope of the FSMP activities to be performed under each Operations Office, list the drivers under which the program will operate, define terms and list references. This guidance will apply only to EM sampling and analysis activities associated with project planning, contracting, laboratory selection, sample collection, sample transportation, laboratory analysis and data management.

1932 (DOE/EM-0198) Guidance for establishment and implementation of a national sample management program in support of EM environmental sampling and analysis activities. Centenary Coll., Shreveport, LA (United States). 18 Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004244. Source: OSTI; NTIS; INIS; GPO Dep.

The role of the National Sample Management Program (NSMP) proposed by the Department of Energy's Office of Environmental Management (EM) is to be a resource for EM programs and for local Field Sample Management Programs (FSMPs). It will be a source of information on sample analysis and data collection within the DOE complex. Therefore the NSMP's primary role is to coordinate and function as a central repository for information collected from the FSMPs. An additional role of the NSMP is to monitor trends in data collected from the FSMPs over time and across sites and laboratories. Tracking these trends will allow identification of potential problems in the sampling and analysis process.

1933 (DOE/EM-0207) Oak Ridge Operations Office, Oak Ridge, Tennessee, technology summary. USDOE Oak Ridge Operations Office, TN (United States). Nov 1994. 116p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003173. Source: OSTI; NTIS; INIS; GPO Dep.

DOE's Office of Technology Development manages an aggressive national program for applied research, development, demonstration, testing, and evaluation. This program develops high-payoff technologies to clean up the inventory of DOE nuclear component manufacturing sites and to manage DOE-generated waste faster, safer, and cheaper than current environmental cleanup technologies. OTD programs are designed to make new, innovative, and more effective technologies available for transfer to users through progressive development. Projects are demonstrated, tested, and evaluated to produce solutions to current problems. Transition of technologies into more advanced stages of development is based upon technological, regulatory, economic, and institutional criteria. New technologies are made available for use in eliminating radioactive, hazardous, and

other wastes in compliance with regulatory mandates. The primary goal is to protect human health and prevent further contamination. OTD technologies address three specific problem areas: (1) groundwater and soils cleanup; (2) waste retrieval and processing; and (3) pollution prevention. Programs of each are discussed in this document. Technical solutions developed within OTD programs will benefit DOE, and should have direct applications in outside markets. OTD's approach to technology development is an integrated process that seeks to identify technologies and development partners, and facilitates the movement of a technology from applied research to implementation.

1934 (DOE/EM-0216) FY 1994 program summary: Office of Technology Development, Office of Research and Development, Office of Demonstration, Testing, and Evaluation. USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Office of Environmental Restoration. Oct 1994. 242p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003756. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Office of Environmental Management, formerly the Office of Environmental Restoration and Waste Management (EM), was established in November 1989 as the first step toward correcting contamination problems resulting from nearly 50 years of nuclear weapons production and fuel processing activities. EM consolidates several DOE organizations previously responsible for the handling, treatment, and disposition of radioactive and hazardous waste. Within EM, the Office of Technology Development (OTD/EM-50) is responsible for developing technologies to meet DOE's goal for environmental restoration. OTD manages an aggressive national program of applied research, development, demonstration, testing, and evaluation (RDDT and E) for environmental cleanup, waste management, and related technologies. The program is designed to resolve major technical issues, to rapidly advanced beyond current technologies for environmental restoration and waste management operations, and to expedite compliance with applicable environmental laws and regulations. This report summarizes Fiscal Year 1994 (FY94) programmatic information, accomplishments, and planned activities relevant to the individual activities within OTD's RDDT and E.

1935 (DOE/EM-0217) The Western Environmental Technology Office (WETO) Butte, Montana. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Oct 1994. 58p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003790. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared to highlight the research, development, demonstration, testing and evaluation activities funded through the Western Environmental Technology Office (WETO) in Butte, Montana. Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US industry's competitiveness in global environmental markets. This information has been assembled from recently produced Office of Technology Development (OTD) documents which highlight technology development activities within each of the OTD program elements. Projects include: Heavy metals contaminated soil project; In Situ remediation integrated program; Minimum additive waste stabilization

program; Resource recovery project; Buried waste integrated demonstration; Mixed waste integrated program; Pollution prevention program; and Mine waste technology program.

1936 (DOE/EM-0218) Technical program plan for the transitioning, decommissioning, and final disposition focus area. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). [1994]. 303p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003792. Source: OSTI; NTIS; INIS; GPO Dep.

The end of the Cold War and the decision to reduce the size of the nuclear weapons production complex have created a need for DOE to deactivate, decontaminate, and decommission (D&D) a large number of aging, surplus facilities. The nature and magnitude of the facility D&D problems require EM to facilitate the development and application of technologies that will address these problems quickly and cost-effectively. The needed technologies can best be provided by integrating the strengths of DOE's national laboratories with those of industry, universities, and other government agencies. To help focus and direct these activities toward achieving DOE's goals, the EM Office of Technology Development (OTD) devised the strategic concept of an Integrated Demonstration (ID), which involves selecting, demonstrating, testing, and evaluating an integrated set of technologies tailored to provide a complete solution to specific EM problems, such as those posed by D&D. The ID approach allows optimal use of DOE's resources by avoiding duplication of effort and ensuring rapid demonstration of applicable technologies. Many technologies, including both the commercially mature and the innovative, are combined and evaluated for a cradle-to-grave solution to specific EM problems in areas such as D&D. The process will involve transforming an existing problem condition to a desired end state, recycling waste materials generated, wherever feasible, and minimizing requirements for waste disposal. The D&D ID Strategic Plan has been prepared by a Technical Support Group (TSG) assembled from various sites within the DOE Complex and intended to identify cross-cutting problem areas amenable to applications of the D&D ID concept and to develop specific ID proposals for these problem areas.

1937 (DOE/EM-0222) Oakland Operations Office, Oakland, California: Technology summary. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Nov 1994. 99p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003622. Source: OSTI; NTIS; INIS; GPO Dep.

DOE's Office of Technology Development manages an aggressive national program for applied research, development, demonstration, testing, and evaluation. This program develops high, payoff technologies to clean up the inventory of DOE nuclear component manufacturing sites and to manage DOE-generated waste faster, safer, and cheaper than current environmental cleanup technologies. OTD programs are designed to make new, innovative, and more effective technologies available for transfer to users through progressive development. Projects are demonstrated, tested, and evaluated to produce solutions to current problems. Transition of technologies into more advanced stages of development is based upon technological, regulatory, economic, and institutional criteria. New technologies are made

available for use in eliminating radioactive, hazardous, and other wastes in compliance with regulatory mandates. The primary goal is to protect human health and prevent further contamination. OTD technologies address three specific problem areas: (1) groundwater and soils cleanup; (2) waste retrieval and processing; and (3) pollution prevention.

1938 (DOE/EM-0223-Vol.1) Report on DOE analytical laboratory capacity available to meet EM environmental sampling and analysis needs for FY 93-99. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). 30 Nov 1994. 50p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004505. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Analytical Laboratory Capacity Study was conducted to give EM-263 current information about existing and future analytical capacities and capabilities of site laboratories within the DOE Complex. Each DOE site may have one or more analytical laboratories in operation. These facilities were established to support site missions such as production, research and development, and personnel and environmental monitoring. With changing site missions and the DOE directives for environmental monitoring and cleanup, these laboratories are either devoting or planning to devote resources to support EM activities. The DOE site laboratories represent a considerable amount of capital investment and analytical capability, capacity, and expertise that can be applied to support the EM mission. They not only provide cost-effective high-volume analytical laboratory services, but are also highly recognized analytical research and development centers. Several sites have already transferred their analytical capability from traditional production support to environmental monitoring and waste management support. A model was developed to determine the analytical capacity of all laboratories in the DOE Complex. The model was applied at nearly all the major laboratories and the results collected from these studies are summarized in this report.

1939 (DOE/EM-0223-Vol.2) Appendices to report on DOE analytical laboratory capacity available to meet EM environmental sampling and analysis needs for FY 93-99. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). 30 Nov 1994. 383p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004506. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Analytical Laboratory Capacity Study was conducted to give EM-263 current information about existing and future analytical capacities and capabilities of site laboratories within the DOE Complex. Each DOE site may have one or more analytical laboratories in operation. These facilities were established to support site missions such as production, research and development, and personnel and environmental monitoring. With changing site missions and the DOE directives for environmental monitoring and cleanup, these laboratories are either devoting or planning to devote resources to support EM activities. The DOE site laboratories represent a considerable amount of capital investment and analytical capability, capacity, and expertise that can be applied to support the EM mission. They not only provide cost-effective high-volume analytical laboratory services, but are also highly recognized analytical research and development centers. Several sites have already transferred their analytical capability from traditional production support to environmental monitoring and waste management support. A model was developed to determine the

analytical capacity of all laboratories in the DOE Complex. The model was applied at nearly all the major laboratories and the results collected from these studies are summarized in this report.

1940 (DOE/EM-0226) Chicago Operations Office: Technology summary. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Dec 1994. 208p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004984. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared by the Department of Energy's (DOE) Environmental Management (EM) Office of Technology Development (OTD) to highlight its research, development, demonstration, testing, and evaluation (RDDT and E) activities funded through the Chicago Operations Office. Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US Industry's competitiveness in global environmental markets. The information has been assembled from recently produced OTD documents which highlight technology development activities within each of the OTD program elements. OTD technologies addresses three specific problem areas: (1) groundwater and soils cleanup; (2) waste retrieval and processing; and (3) pollution prevention. These problems are not unique to DOE, but are associated with other Federal agency and industry sites as well. Thus, technical solutions developed within OTD programs will benefit DOE, and should have direct applications in outside markets.

1941 (DOE/EM-0228) Environmental Management 1995: Progress and plans of the Environmental Management Program. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Feb 1995. 104p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008736. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Management 1995 is the second report prepared in response to the requirements of the National Defense Authorization Act for Fiscal Year 1994. The first report, Environmental Management 1994, was published in February 1994. This report is intended to provide a broad overview of the Environmental Management program's activities in 1994, 1995, and 1996. The first section of this report describes the Department of Energy's Environmental Management program. This is followed by a closer look at what the program is doing across the country, organized by region to help the reader identify and locate sites of interest. Within each region, details of the largest sites are followed by site summaries reported by State and a summary of activities under the Formerly Utilized Sites Remedial Action Program (FUSRAP) and Uranium Mill Tailings Remedial Action Project (UMTRA). For the purposes of this report, a "site" is a Department of Energy installation; a "facility" is a building located on a Department of Energy site; and an "area" is a geographical area, operable unit, or waste area group of unspecified dimension within a site. Throughout this report, "year" refers to the Federal Government's Fiscal Year, which begins on October 1. For example, Fiscal Year 1995 began on October 1, 1994 and will end on September 30, 1995. Budget totals for Hanford include the Hanford Site and Richland Operations Office. The Idaho National Engineering Laboratory includes the Idaho Chemical Processing Plant and the Idaho Operations Office. The Oak Ridge

Reservation budget includes Oak Ridge National Laboratory, the Y-12 Plant, the K-25 Site, Oak Ridge Associated Laboratories, the Oak Ridge Operations Office, and funding for the FUSRAP program.

1942 (DOE/EM-0232) Estimating the Cold War mortgage: The 1995 Baseline Environmental Management report. Executive summary, March 1995. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95011575. Source: OSTI; NTIS; INIS; GPO Dep.

This is the first annual report on the activities and potential costs required to address the waste, contamination, and surplus nuclear facilities that are the responsibility of DOE's Environmental Management program. Of the Base Case life-cycle cost estimate of \$230 billion from 1995 to 2070, 49% is waste management, 28% environmental restoration, 10% nuclear material and facility stabilization, 5% technology development, and 8% other. The top 5 sites account for 70% of the costs: Hanford 21%, Savannah River Site 21%, Rocky Flats 10%, Oak Ridge 10%, and Idaho Laboratory 8%. Assumptions include significant productivity increases, meeting current compliance requirements, and use of existing technologies. Excluded were: cleanup where no feasible cleanup technology exists (eg, nuclear explosion sites and most contaminated groundwater), cleanup of currently active facilities, naval nuclear propulsion facilities (handled by US Navy), and first 5 years of program (\$23 billion). Of the alternative cases evaluated, land use has the biggest potential cost impact. Total projected environmental costs are comparable to total U.S. nuclear weapons production costs. The makeup of Volumes I and II (the latter being site summaries) are outlined briefly.

1943 (DOE/EM-0232-Vol.1) Estimating the Cold War mortgage: The 1995 baseline environmental management report. Volume 1. Nuclear Waste Documentary Project, Strawberry Plains, TN (United States). Mar 1995. 196p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010461. Source: OSTI; NTIS; INIS; GPO Dep.

This is the first annual report on the activities and potential costs required to address the waste, contamination, and surplus nuclear facilities that are the responsibility of the Department of Energy's Environmental Management program. The Department's Office of Environmental Management, established in 1989, manages one of the largest environmental programs in the world—with more than 130 sites and facilities in over 30 States and territories. The primary focus of the program is to reduce health and safety risks from radioactive waste and contamination resulting from the production, development, and testing of nuclear weapons. The program also is responsible for the environmental legacy from, and ongoing waste management for, nuclear energy research and development, and basic science research. In an attempt to better oversee this effort, Congress required the Secretary of Energy to submit a Baseline Environmental Management Report with annual updates. The 1995 Baseline Environmental Management Report provides life-cycle cost estimates, tentative schedules, and projected activities necessary to complete the Environmental Management program.

1944 (DOE/EM-0233) The Formerly Utilized Sites Remedial Action Program (FUSRAP): Building stakeholder partnerships to achieve effective cleanup.

USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Environmental Restoration. Apr 1995. 36p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010337. Source: OSTI; NTIS; INIS; GPO Dep.

This booklet describes the U.S. Department of Energy's (DOE's) Formerly Utilized Sites Remedial Action Program (FUSRAP). This document describes the history of the FUSRAP program and discusses the ongoing and planned efforts to remediate FUSRAP sites. The U.S. DOE created FUSRAP in 1974 to identify, investigate, and clean up or control sites where contamination above today's guidelines remains from the early years of the nation's atomic energy programs.

1945 (DOE/ID-10390(94)-Rev.1) Idaho National Engineering Laboratory site development plan. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 174p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001906. Source: OSTI; NTIS; INIS; GPO Dep.

This plan briefly describes the 20-year outlook for the Idaho National Engineering Laboratory (INEL). Missions, workloads, worker populations, facilities, land, and other resources necessary to fulfill the 20-year site development vision for the INEL are addressed. In addition, the plan examines factors that could enhance or deter new or expanded missions at the INEL. And finally, the plan discusses specific site development issues facing the INEL, possible solutions, resources required to resolve these issues, and the anticipated impacts if these issues remain unresolved.

1946 (DOE/ID/12584-179) Field calibration facilities for environmental measurement of radium, thorium, and potassium: Third edition. Leino, R.; George, D.C.; Key, B.N.; Knight, L.; Steele, W.D. Rust Geotech, Inc., Grand Junction, CO (United States). Jun 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJ/TMC-01-Ed.3). Order Number DE94017287. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes calibration facilities located at Grand Junction, Colorado, and at three secondary sites. These facilities are available to contractors for the calibration of radiometric field instrumentation for in situ measurements of radium, thorium, and potassium. The US Department of Energy and its predecessor agencies constructed all of the calibration facilities described herein for use in annual uranium-reserve determinations. The use of these facilities for the calibration of radiometric field instruments used in remedial action is made possible by the commonality of the radiometric measurement technique for uranium and for radium. The use of these facilities standardizes remedial action measurements in a cost-effective manner.

1947 (DOE/MC/30162-95/C0435) Electrokinetic decontamination of concrete. Lomasney, H.L.; Yachmenev, V. Isotron Corp., New Orleans, LA (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30162. (CONF-9411149-20: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007974. Source: OSTI; NTIS; INIS; GPO Dep.

Concrete structures which have been contaminated with uranium and other radioisotopes may be decontaminated using in-situ electrokinetic remediation. By placing an electrode cell on the concrete surface and using the concrete's

rebar, a ground rod, or another surface cell as the counter electrode, the radioisotopes may be migrated from the concrete into this cell. The process is highly dependent upon the chemical parameters of the species involved; namely, the concrete, the contaminants, and the solubilizers used to mobilize the contaminants. In a preliminary study conducted at the K-25 Site of the Oak Ridge National Labs, an estimated removal of >40 percent of uranium has been observed for a short duration run. This removal occurred using traditional uranium solubilizers in contact with the contaminated surface.

1948 (DOE/MC/30164-4000) Concrete decontamination by Electro-Hydraulic Scabbling (EHS). Textron, Inc., Everett, MA (United States). Textron Defense Systems. Nov 1994. 206p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30164. Order Number DE95000074. Source: OSTI; NTIS; INIS; GPO Dep.

EHS is being developed for decontaminating concrete structures from radionuclides, organic substances, and hazardous metals. EHS involves the generation of powerful shock waves and intense cavitation by a strong pulsed electric discharge in a water layer at the concrete surface; high impulse pressure results in stresses which crack and peel off a concrete layer of controllable thickness. Scabbling produces contaminated debris of relatively small volume which can be easily removed, leaving clean bulk concrete. Objective of Phase I was to prove the technical feasibility of EH for controlled scabbling and decontamination of concrete. Phase I is complete.

1949 (DOE/MC/30168-94/C0348) Chemical decontamination of process equipment using recyclable chelating agents. Palmer, P.A. Babcock and Wilcox Co., Alliance, OH (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30168. (CONF-940853-11: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE95000567. Source: OSTI; NTIS; INIS; GPO Dep.

The Babcock and Wilcox Company is performing research and development in the application of chelating chemicals to dissolve uranium compounds and other actinide species from the surfaces of DOE process equipment. A chelating system specific for the removal of uranium and other actinides will be applied to the component selected for full-scale demonstration of the process. After application of the chelating solvent for an appropriate time period, the spent solvent will be removed to a waste processing facility, and the dissolved radioactive contaminants will be precipitated out of the solution. The regenerated chelating solvent will then be available for reuse in the cleaning system, thereby minimizing the amount of secondary waste generated by the process. Phase 1 activity has begun with bench-scale tests in the laboratory, to screen and optimize candidate solvent systems, and will proceed to development of a chemical cleaning process that will be tested in a pilot facility on an actual piece of contaminated equipment. The potential for application of the chelating agent as a foam rather than a liquid will also be investigated. The advantage of foaming application is a reduction of solvent volume requiring eventual treatment. The second phase of this program will be a full-scale demonstration of the developed technology on contaminated process equipment at a DOE site.

1950 (DOE/MC/30171-95/C0434) Catalytic extraction processing of contaminated scrap metal. Griffin, T.P.;

Johnston, J.E. Molten Metals Technology, Inc., Waltham, MA (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30171. (CONF-9411149-16: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007694. Source: OSTI; NTIS; INIS; GPO Dep.

The contract was conceived to establish the commercial capability of Catalytic Extraction Processing (CEP) to treat contaminated scrap metal in the DOE inventory. In so doing, Molten Metal Technology, Inc. (MMT), pursued the following objectives: demonstration of the recycling of ferrous and non-ferrous metals—to establish that radioactively contaminated scrap metal can be converted to high-grade, ferrous and non-ferrous alloys which can be reused by DOE or reintroduced into commerce; immobilize radionuclides—that CEP will concentrate the radionuclides in a dense vitreous phase, minimize secondary waste generation and stabilize and reduce waste volume; destroy hazardous organics—that CEP will convert hazardous organics to valuable industrial gases, which can be used as feed gases for chemical synthesis or as an energy source; recovery volatile heavy metals—that CEP's off-gas treatment system will capture volatile heavy metals, such as mercury and lead; and establish that CEP is economical for processing contaminated scrap metal in the DOE inventory—that CEP is a more cost-effective and, complete treatment and recycling technology than competing technologies for processing contaminated scrap. The process and its performance are described.

1951 (DOE/MC/30172-95/C0433) Characterization of radioactive contamination inside pipes with the Pipe Explorer™ system. Lowry, W. Science and Engineering Associates, Inc., Santa Fe, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30172. (CONF-9411149-19: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007973. Source: OSTI; NTIS; INIS; GPO Dep.

The objective for the development of the Pipe Explorer™ radiological characterization system is to achieve a cost effective, low risk means of characterizing gamma radioactivity on the inside surface of pipes. The unique feature of this inspection system is the use of a pneumatically inflated impermeable membrane which transports the detector into the pipe as it inverts. The membrane's internal air pressure tows the detector and tether through the pipe. This mechanism isolates the detector and its cabling from the contaminated surface, yet allows measurement of radioactive emissions which can readily penetrate the thin plastic membrane material (such as gamma and high energy beta emissions). In Phase 1, an initial survey of DOE facilities was conducted to determine the physical and radiological characteristics of piping systems. The inverting membrane deployment system was designed and extensively tested in the laboratory. A range of membrane materials was tested to evaluate their ruggedness and deployment characteristics. Two different sizes of gamma scintillation detectors were procured and tested with calibrated sources. Radiation transport modeling evaluated the measurement system's sensitivity to detector position relative to the contaminated surface, the distribution of the contamination, background gamma levels, and gamma source energy levels. In the culmination of Phase 1, a field demonstration was conducted at the Idaho National Engineering Laboratory's Idaho Chemical Processing Plant. The project is currently in transition from

Phase 1 to Phase 2, where more extensive demonstrations will occur at several sites. Results to date are discussed.

1952 (DOE/MC/30174-95/C0446) Thermal sampling head and system for concrete walls. Barren, E.; Berdahl, D.R.; Dorn, S.B.; Feldman, S.F.; Ortiz, A.L. Jr.; Penny, C.M.; Staver, P.R. General Electric Co., Schenectady, NY (United States). Research and Development Center. [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30174. (CONF-950209-3: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE95008385. Source: OSTI; NTIS; GPO Dep.

We have determined that the thermal sampling approach gives more accurate results of analyte levels on concrete surfaces when compared to the standard wipe test methods. The use of a quick-look detector eliminates the need to analyze "clean" environmental samples. The sorption tubes have been shown to provide a reliable quantitative means for transfer of analyte to an automated thermal desorption interface to a GC. We will be extending our work to include sampling of steel surfaces in Phase II of this program. Models of the extraction process for porous surfaces such as concrete will be developed in the next phase of this program.

1953 (DOE/MC/30176-3937) Three-Dimensional Integrated Characterization and Archiving System (3D-ICAS). Phase 1. Coleman Research Corp., Springfield, VA (United States). Jul 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30176. Order Number DE95000030. Source: OSTI; NTIS; INIS; GPO Dep.

3D-ICAS is being developed to support Decontamination and Decommissioning operations for DOE addressing Research Area 6 (characterization) of the Program Research and Development Announcement. 3D-ICAS provides in-situ 3-dimensional characterization of contaminated DOE facilities. Its multisensor probe contains a GC/MS (gas chromatography/mass spectrometry using noncontact infrared heating) sensor for organics, a molecular vibrational sensor for base material identification, and a radionuclide sensor for radioactive contaminants. It will provide real-time quantitative measurements of volatile organics and radionuclides on bare materials (concrete, asbestos, transite); it will provide 3-D display of the fusion of all measurements; and it will archive the measurements for regulatory documentation. It consists of two robotic mobile platforms that operate in hazardous environments linked to an integrated workstation in a safe environment.

1954 (DOE/MC/30179-95/C0440) Protective clothing based on permselective membrane and carbon adsorption. Baker, R. Membrane Technology and Research, Inc., Menlo Park, CA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30179. (CONF-9411149-2: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007692. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to develop improved protective clothing for use by workers engaged in decommissioning and decontamination of former DOE sites. The proposed technology concerns a new protective clothing fabric that combines a permselective membrane layer (for water transmission and breathability) with a sorptive layer.

1955 (DOE/MC/30359-95/C0420) **Laser surface cleaning.** Freiwald, J.G.; Freiwald, D.A. F2 Associates, Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC30359. (CONF-9411149-14: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007497. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this work is a laboratory demonstration that red-lead primer and two-part epoxy paints can be stripped from concrete and metal surfaces using surface cleaning systems based on pulsed-repetition CO₂ lasers. The three goals are to: (1) demonstrate coatings removal, including surface pore cleaning; (2) demonstrate that there is negligible release of ablated contaminants to the environment; and (3) demonstrate that the process will generate negligible amounts of additional waste compared to competing technologies. Phase 1 involved site visits to RMI and Fernald to assess the cleaning issues for buildings and parts. In addition, Phase 1 included detailed designs of a more powerful system for industrial cleaning rates, including laser, articulating optics, ablated-material capture suction nozzle attached to a horizontal raster scanner for floor cleaning, and filtration system. Some concept development is also being done for using robots, and for parts cleaning. In Phase 2 a transportable 6 kW system will be built and tested, with a horizontal surface scanner for cleaning paint from floors. The laboratory tests will again be instrumented. Some concept development will continue for using robots, and for parts cleaning. This report describes Phase 1 results.

1956 (DOE/MC/30359-3990) **Laser ablation of contaminants from concrete and metal surfaces. Topical report, June-December 1994.** Freiwald, J.; Freiwald, D.A. F2 Associates, Albuquerque, NM (United States). Dec 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC30359. Order Number DE95000066. Source: OSTI; NTIS; GPO Dep.

Tests have demonstrated that it is possible to clean coatings off surfaces using high-power, pulsed, high-repetition-rate lasers. Purpose of this contract is to demonstrate (1) that pulsed-repetition lasers can be used to remove paint from concrete and metal surfaces, including cleaning out the surface pores, (2) that the cleaning process will result in negligible release of contaminated ablated material to the environment, and (3) that the process generates negligible additional waste compared to competing technologies. This report covers technical progress during Phase 1 of the contract and makes recommendations for technology development in Phase 2.

1957 (DOE/OR-01-1117/V4) **Oak Ridge Reservation Federal Facility Agreement for the Environmental Restoration Program. Volume 4: Quarterly report, July-September 1993.** Oak Ridge National Lab., TN (United States). Oct 1993. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3094). Order Number DE94014030. Source: OSTI; NTIS; INIS; GPO Dep.

This quarterly progress report satisfies requirements for the Environmental Restoration (ER) Program that are specified in the Oak Ridge Reservation (ORR) Federal Facility Agreement (FFA) established between the U.S. Department of Energy (DOE), the U.S. Environmental protection Agency (EPA), and the Tennessee Department of Environment and Conservation (TDEC). The reporting period covered is July

through September 1993 (fourth quarter of FY 1993). Sections 1.1 and 1.2 provide respectively the milestones scheduled for completion during the reporting period and a list of documents that have been proposed for transmittal during the following quarter but have not been approved as FY 1994 commitments.

1958 (DOE/OR-01-1173-D2) **Remedial Investigation Work Plan for Chestnut Ridge Operable Unit 1 (Chestnut Ridge Security Pits) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Mar 1994. 554p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER-112-D2). Order Number DE95000616. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the activities necessary to conduct a Remedial Investigation (RI) of the Chestnut Ridge Security Pits (CRSP) at the Oak Ridge Y-12 Plant. The CRSP, also designated Chestnut Ridge Operable Unit (OU) 1, is one of four OUs along Chestnut Ridge on the Oak Ridge Reservation (ORR). The purpose of the RI is to collect data to (1) evaluate the nature and extent of known and suspected contaminants, (2) support an Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA), (3) support the feasibility study in the development and analysis of remedial alternatives, and (4) ultimately, develop a Record of Decision (ROD) for the site. This chapter summarizes the regulatory background of environmental investigation on the ORR and the approach currently being followed and provides an overview of the RI to be conducted at the CRSP. Subsequent chapters provide details on site history, sampling activities, procedures and methods, quality assurance (QA), health and safety, and waste management related to the RI.

1959 (DOE/OR-01-1226/V2) **Oak Ridge Reservation Federal Facility agreement quarterly report for the Environmental Restoration Program, January-March 1994: Volume 2.** Oak Ridge National Lab., TN (United States). Apr 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-3574). Order Number DE94014031. Source: OSTI; NTIS; GPO Dep.

This quarterly progress report satisfies requirements for the Environmental Restoration (ER) Program that are specified in the Oak Ridge Reservation (ORR) Federal Facility Agreement (FFA) established between the US Department of Energy (DOE), the US Environmental Protection Agency (EPA), and the Tennessee Department of Environment and Conservation (TDEC). The reporting period covered herein is January through March 1994 (second quarter of FY 1994). Sections 1.1 and 1.2 provide respectively the milestones scheduled for completion during the reporting period and a list of documents that have been proposed for transmittal during the following quarter but have not been approved as FY 1994 commitments. Section 2 covers significant accomplishments. Section 3 discusses technical status at the Oak Ridge Y-12 Plant, Oak Ridge National Laboratory, Oak Ridge K-25 Site, and Clinch River. Technical oversight and technical programs are also covered. Section 4 covers responds action contractor assignments.

1960 (DOE/OR-01-1268/V2-D1) **Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes.** Oak Ridge National Lab., TN (United States);

CDM Federal Programs Corp., Oak Ridge, TN (United States). Aug 1994. 772p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER-172/V2-D1). Order Number DE95001698. Source: OSTI; NTIS; INIS; GPO Dep.

This report comprises appendices A-J which support the Y-12 Plant's remedial action report involving Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch). The appendices cover the following: Sampling fish from McCoy Branch; well and piezometer logs; ecological effects of contaminants in McCoy Branch 1989-1990; heavy metal bioaccumulation data; microbes in polluted sediments; and baseline human health risk assessment data.

1961 (DOE/OR-01-1273/V1-D1) Remedial Investigation report on Bear Creek Valley Operable Unit 2 (Rust Spoil Area, Spoil Area 1, and SY-200 Yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Volume 1, Main text. Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Aug 1994. 510p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER-182/V1-D1). Order Number DE95002066. Source: OSTI; NTIS; INIS; GPO Dep.

The enactment of the Resource Conservation and Recovery Act (RCRA) in 1976 and the Hazardous and Solid Waste Amendments (HSWA) to RCRA in 1984 created management requirements for hazardous waste facilities. The facilities within the Oak Ridge Reservation (ORR) were in the process of meeting the RCRA requirements when the ORR was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) on November 21, 1989. Under RCRA, the actions typically follow the RCRA Facility Assessment/RCRA Facility Investigation (RFI)/Corrective Measures Study (CMS)/Corrective Measures Implementation process. Under CERCLA, the actions follow the preliminary assessment/site investigation/Remedial Investigation (RI)/Feasibility Study (FS)/Remedial Design/Remedial Action process. This document incorporates requirements under both RCRA and CERCLA in the form of an RI report for the characterization of Bear Creek Valley (BCV) Operable Unit (OU) 2.

1962 (DOE/OR-01-1273/V1-D2) Remedial Investigation Report on Bear Creek Valley Operable Unit 2 (Rust Spoil Area, Spoil Area 1, and SY-200 Yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Volume 1, Main text. Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Jan 1995. 515p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER-182/V1-D2). Order Number DE95009509. Source: OSTI; NTIS; INIS; GPO Dep.

This report on the BCV OU 2 at the Y-12 Plant, was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for reporting the results of a site characterization for public review. It provides the Environmental Restoration Program with information about the results of the 1993 investigation. It includes information on risk assessments that have evaluated impacts to human health and the environment. Field activities included collection of subsurface soil samples, groundwater and surface water samples, and sediments and seep at the Rust Spoil Area (RSA), SY-200 Yard, and SA-1.

1963 (DOE/OR-01-1273/V2-D1) Remedial Investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendices. Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Aug 1994. 597p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER-182/V2-D1). Order Number DE95002067. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the appendices to the Remedial Investigation Report on Bear Creek Valley Operable Unit 2 (Rust Spoil Area, Spoil Area 1, and SY-200 Yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. The appendices include Current and historical soil boring and groundwater monitoring well information, well construction logs, and field change orders; Analytical data; Human health risk assessment data; and Data quality.

1964 (DOE/OR-01-1292-D1) FY 1995 remedial investigation work plan for Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Watkins, D.R.; Herbes, S.E. (eds.). Oak Ridge National Lab., TN (United States). Sep 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-251-D1). Order Number DE95008504. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4302.

Field activities to support the remedial investigation (RI) of Waste Area Grouping (WAG) 2 at Oak Ridge National Laboratory (ORNL) include characterization of the nature and extent of contamination in WAG 2, specifically to support risk-based remediation decisions. WAG 2 is the major drainage system downgradient of other WAGs containing significant sources of contamination at ORNL. The RI of WAG 2 is developed in three phases: Phase 1, initial scoping characterization to determine the need for early action; Phase 2, interim activities during remediation of upgradient WAGs to evaluate potential changes in the contamination status of WAG 2 that would necessitate reevaluation of the need for early action; and Phase 3, completion of the RI process following remediation of upslope WAGs. Specifically, Phase 2 activities are required to track key areas to determine if changes have occurred in WAG 2 that would require (1) interim remedial action to protect human health and the environment or (2) changes in remedial action plans and schedules for WAG2 because of changing contaminant release patterns in upslope WAGs or because of the effects of interim remedial or removal actions in other WAGs. This report defines activities to be conducted in FY 1995 for completion of the Phase 1 RI and initiation of limited Phase 2 field work.

1965 (DOE/OR-01-1292-D2) FY 1995 Remedial Investigation Work Plan for Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Watkins, D.R.; Herbes, S.E. (eds.). Oak Ridge National Lab., TN (United States). Dec 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-251-D2). Order Number DE95005882. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4302.

The purpose of this project is to provide key information needed by decision makers to expedite the process of environmental restoration and to provide the data base required by the Remedial Investigation/Feasibility Study (RI/FS) for

Waste Area Grouping (WAG) 2 at Oak Ridge National Laboratory (ORNL). WAG 2 is the major drainage system downgradient of other WAGs that contain significant sources of contamination at ORNL. Field activities to support the remedial investigation for the RI portion include characterization of the nature and extent of contamination in WAG 2 [consisting of White Oak Creek (WOC) and associated tributaries and floodplain, White Oak Lake (WOL), and White Oak Creek Embayment (WOCE)], specifically to support risk-based remediation decisions. The project consists of three phases: Phase 1, initial scoping characterization to determine the need for early action; Phase 2, interim activities during remediation of upslope WAGs to evaluate potential changes in the contamination status of WAG 2 that would necessitate reevaluation of the need for early action; and Phase 3, completion of the RI process following remediation of upslope WAGs. Overall RI objectives, consistent with ORNL Environmental Restoration (ER) Program strategic objectives to reduce risks and comply with environmental regulations, are discussed in the WAG 2 Remedial Investigation Plan.

1966 (DOE/OR/22028-T15) DOE Oak Ridge Environmental Restoration Program, technical support contractor. Monthly project status report, February 1995. Jacobs Engineering Group, Inc., Oak Ridge, TN (United States). Feb 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22028. Order Number DE95008331. Source: OSTI; NTIS; INIS; GPO Dep.

This is the monthly Project Status Report (February 1995) of the Jacobs Engineering group, Technical Support contractor for the DOE Oak Ridge Environmental Restoration Program. Included are the following areas of work: non-site specific tasks; Y-12 Plant; ORNL; K-25 site; off-site tasks; Paducah Gaseous Diffusion Plant Portsmouth Gaseous diffusion plant.

1967 (DOE/RL-90-28-Rev.3) Environmental Restoration Project quality system requirements for the Hanford Site. Revision 3. USDOE Richland Operations Office, WA (United States). Mar 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95010194. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the quality system requirements for the US Department of Energy, Richland Operations Office (DOE-RL), Environmental Restoration (ER) Project at the Hanford Site. The Environmental Restoration Project Quality System Requirements for the Hanford Site integrates quality assurance requirements from the DOE Orders, the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement), the Hanford Facility Resource Conservation and Recovery Act of 1976 (RCRA) Permit, and applicable Federal and Washington State regulations. This document, based on ten criteria, provides user organizations with the flexibility to incorporate only those criteria and paragraphs applicable to their specific scopes of work. The requirements of this document are to be applied based on a graded approach that takes into consideration the risk inherent in, as well as the importance of, specific items, services, and activities. The user organizations' quality systems developed to comply with this document are intended to ensure ER Project activities are conducted in a manner that protects human health and the environment while meeting ER Project objectives and customer expectations.

1968 (DOE/RL-91-50-Rev.1) Environmental Monitoring Plan, United States Department of Energy, Richland Operations Office. Revision 1. Pacific Northwest Lab., Richland, WA (United States). 9 Nov 1994. 523p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006731. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes environmental monitoring activities at Hanford Reservation. Attention is focused on effluent monitoring and environmental surveillance. All Hanford contractors reviewed potential sources of contamination. A facility effluent monitoring plan was written for each facility with the potential to release significant quantities of hazardous materials, addressing both radiological and nonradiological effluent monitoring. The environmental surveillance program assesses onsite and offsite environmental impacts and offsite human health exposures. The program monitors air, surface water, sediment, agricultural products, vegetation, soil, and wildlife. In addition, independent onsite surveillance is conducted to evaluate the effectiveness of Hanford Site effluent controls in order to comply with applicable environmental standards and regulations.

1969 (DOE/RL-92-53-Rev.1) 218-E-8 Borrow Pit Demolition Site closure plan: Revision 1. Ruck, F.R. Westinghouse Hanford Co., Richland, WA (United States). 21 Oct 1994. 177p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003043. Source: OSTI; NTIS; INIS; GPO Dep.

The 218-E-8 Demolition Site was the site of a single demolition event in November of 1984. This demolition event was a form of thermal treatment for discarded explosive chemical products. Because the 218-E-8 Demolition Site will no longer be used for this thermal activity, the site will be closed. Closure will be conducted pursuant to the requirements of the Washington State Department of Ecology (Ecology) "Dangerous Waste Regulations," Washington Administrative Code (WAC) 173-303-610 and 40 Code of Federal Regulations (CFR) 270.1. The 218-E-8 Borrow Pit Demolition Site Closure Plan consists of a Hanford Facility Dangerous Waste Part A Permit Application, Form 3, Revision 4, and a closure plan. An explanation of the Part A Form 3, submitted with this closure plan is provided at the beginning of the Part A Section. The closure plan consists of nine chapters and five appendices. This closure plan presents a description of the 218-E-8 Demolition Site, the history of the waste treated, and the approach that will be followed to close the 218-E-8 Demolition Site. Because there were no radioactively contaminated chemicals involved in the demolitions at the 218-E-8 Borrow Pit site, the information on radionuclides is provided for "information only." Remediation of any radioactive contamination is not within the scope of this closure plan. Only dangerous constituents derived from 218-E-8 Demolition Site operations will be addressed in this closure plan in accordance with WAC 173-303-610(2)(b)(i).

1970 (DOE/RL-92-54-Rev.1) 200 West Area Ash Pit Demolition Site closure plan: Revision 1. Ruck, F.R. Westinghouse Hanford Co., Richland, WA (United States). 6 Oct 1994. 177p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003042. Source: OSTI; NTIS; INIS; GPO Dep.

The Ash Pit Demolition Site had two known demolition events, the first occurred in November of 1984, and the second occurred in June of 1986. These demolition events were a form of thermal treatment for discarded explosive chemical

products. Because the Ash Pit Demolition Site will no longer be used for this thermal activity, the site will be closed. Closure will be conducted pursuant to the requirements of the Washington State Department of Ecology (Ecology) "Dangerous Waste Regulations", Washington Administrative Code (WAC) 173-303-610 and 40 Code of Federal Regulations (CFR) 270.1. The 200 West Area Ash Pit Demolition Site Closure Plan consists of a Part A, Form 3, Dangerous Waste Permit Application (Revision 4) and a closure plan. An explanation of the Part A, Form 3, submitted with this closure plan is provided at the beginning of the Part A Section. The closure plan consists of nine chapters and five appendices. This closure plan presents a description of the Ash Pit Demolition Site, the history of the waste treated, and the approach that will be followed to close the Ash Pit Demolition Site. Because there were no radioactively contaminated chemicals involved in the demolitions, the information on radionuclides is provided for "information only". Remediation of any radioactive contamination is not within the scope of this closure plan. Only dangerous constituents derived from Ash Pit Demolition Site operations will be addressed in this closure plan in accordance with WAC 173-303-610(2)(b)(i).

1971 (DOE/RL-93-29) Limited field investigation report for the 100-DR-1 Operable Unit. USDOE Richland Operations Office, WA (United States). Jun 1994. 244p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015670. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) report summarizes the data collection and analysis activities conducted during the 100-DR-1 Source Operable Unit LFI and the associated qualitative risk assessment (QRA), and makes recommendations on the continued candidacy of high-priority sites for interim remedial measures (IRM). The results and recommendations presented in this report are generally independent of future land use scenarios. The 100-DR-1 Operable Unit is one of four operable units associated with the 100 D/DR Area at the Hanford Site. The 100-DR-1 Operable Unit encompasses approximately 1.5 km² (0.59 mi²) and is located immediately adjacent to the Columbia River shoreline. In general, it contains waste facilities associated with the original plant facilities constructed to support D Reactor facilities, as well as cooling water retention basin systems for both D and DR Reactors. The 100-DR-1 LFI began the investigative phase of the remedial investigation for a select number of high-priority sites. The LFI was performed to provide additional data needed to support selection, design and implementation of IRM, if needed. The LFI included data compilation, nonintrusive investigations, intrusive investigations, summarization of 100 Area aggregate studies, and data evaluation.

1972 (DOE/RL-93-54-Draft-A) Risk evaluation of remedial alternatives for the Hanford Site. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007600. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance on the process of risk evaluation of remedial alternatives (RERA) at the Hanford Site. Remediation activities at the Hanford Site are being conducted pursuant to the Comprehensive Environmental Restoration, Compensation, and Liability Act and the Resource Conservation and Recovery Act. This document identifies points in the remedial alternative selection process

where risk assessment input is either required or desirable. For each of these points of application, the document identifies issues to consider and address, and suggests possible approaches, techniques, and appropriate levels of detail. The level of detail of a RERA is driven by the need to use risk as a criterion for selecting a remedial alternative. Such a document is needed to ensure that RERA is conducted in a consistent manner, and to prevent restating or creating guidance within each RERA.

1973 (DOE/RL-93-74-Draft-A-Vol.1) 200-BP-11 operable unit and 216-B-3 main pond work/closure plan, Hanford Site, Richland, Washington. Volume 1: Field investigation and sampling strategy. Department of Energy, Richland, WA (United States). Richland Operations Office. Sep 1994. 273p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007705. Source: OSTI; INIS; NTIS; GPO Dep.

This document coordinates a Resource Conservation and Recovery Act (RCRA) past-practice work plan for the 200-BP-11 Operable Unit and a RCRA closure/postclosure plan for the 216-B-3 Main Pond and 216-B-3-3 Ditch [treatment, storage, and/or disposal (TSD) unit]. Both RCRA TSD and past-practice waste management units are contained within the 200-BP-11 Operable Unit. The 200-BP-11 Operable Unit is a source operable unit located on the east side of the B Plant Source Aggregate Area in the 200 East Area of the Hanford Site. The operable unit lies just east of the 200 East Area perimeter fence and encompass approximately 476 hectares (1,175 acres). Source operable units include waste management units that are potential sources of radioactive and/or hazardous substance contamination. Source waste management units are categorized in the Hanford Federal Facility Agreement and Consent Order as either RCRA TSD, RCRA past-practice, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) past-practice. As listed below and in the Tri-Party Agreement, the 200-BP-11 Operable Unit contains five RCRA past-practice and five RCRA TSD waste management units. Additionally, for RCRA TSD permitting purposes, the RCRA TSD waste management units are subdivided into two RCRA TSD units.

1974 (DOE/RL-93-80) Limited field investigation report for the 100-NR-1 Operable Unit. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Mar 1995. 274p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008698. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) report summarizes the data collection and analysis activities conducted during the 100-NR-1 Source Operable Unit LFI and the associated qualitative risk assessment (QRA), and makes recommendations on the continued candidacy of high-priority sites for interim remedial measures (IRM). The results and recommendations presented in this report are generally independent of future land-use scenarios. This report is unique in that it is based on Hanford-specific agreements discussed in the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al. 1992), the Hanford Site Risk Assessment Methodology (DOE-RL 1994a), the Remedial Investigation Feasibility Study Work Plan for the 100-NR-1 Operable Unit (DOE-RL 1992a), and the Hanford Past-Practice Strategy (HPPS) (DOE-RL 1991), and must be viewed in this context. The HPPS emphasizes initiating and completing waste site cleanup through interim

actions. The strategy includes paths for interim decision-making and a final remedy-selection process for the operable unit. A LFI report is required, in accordance with the HPPS, when waste sites are to be considered for IRM and existing data are insufficient to formulate a conceptual model or perform a QRA. The purpose of the report is to identify those sites that are recommended to remain as candidates for IRM, provide a preliminary summary of site characterization studies, refine the conceptual model as needed, identify potential contaminant- and location-specific applicable or relevant and appropriate requirements (ARAR), and provide a qualitative assessment of the risks associated with the sites. This assessment includes consideration of whether contaminant concentrations pose a risk to human health or the environment that warrants action through IRM.

1975 (DOE/RL-93-80-Draft-A) Limited field investigation report for the 100-NR-1 operable unit. Draft A. USDOE Richland Operations Office, WA (United States). Aug 1994. 280p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009010. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) report summarizes the data collection and analysis activities conducted during the 100-NR-1 Source Operable Unit LFI and the associated qualitative risk assessment (QRA), and makes recommendations on the continued candidacy of high-priority sites for interim remedial measures (IRM). The results and recommendations presented in this report are generally independent of future land-use scenarios. An LFI report is required when waste sites are to be considered for IRM and existing data are insufficient to formulate a conceptual model or perform a QRA. The purpose of the report is to identify those sites that are recommended to remain as candidates for IRM, provide a preliminary summary of site characterization studies, refine the conceptual model as needed, identify potential contaminant and location-specific applicable or relevant and appropriate requirements (ARAR), and provide a qualitative assessment of the risks associated with the sites. This assessment includes consideration of whether contaminant concentrations pose a risk to human health or the environment that warrants action through IRM. Seven sites were intrusively investigated: 1322-N, 116-N-2, 119-N, 120-N-2, 120-N-1, South Settling Pond, and the 166-N Tank Farm (UN-100-N-17) unplanned release at the 166-N Tank Farm. Vadose zone sediments from these sites were sampled and analyzed. Radiological contamination is the primary concern as confirmed through this study.

1976 (DOE/RL-93-81) Limited field investigation report for the 100-NR-2 Operable Unit, Hanford Site, Richland, Washington. USDOE Richland Operations Office, WA (United States). Mar 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009565. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) was conducted to determine the nature and extent of hazardous and radioactive materials present in the groundwater. This information is used to assess the applicability of interim remedial measures (IRM) for reducing human health and environmental risks within the 100-NR-2 Groundwater Operable Unit. Sampling of existing wells and the installation of one new monitoring well were the methods of investigation used during this LFI. Analytical data were subjected to validation under the Resource Conservation and Recovery Act (RCRA) program. The groundwater analyses were screened

to identify contaminants of potential concern (COPC). This screening method eliminated from further consideration constituents that were below background. Constituents considered nontoxic to humans were eliminated from the human health evaluation. Data inconsistency and blank contamination were also evaluated in the screening process. These COPC were evaluated further in the qualitative risk assessment (QRA). A QRA was performed using conservative analyses. The human health risk assessment evaluated frequent-use and occasional-use scenarios. The QRA analysis indicates that there is a medium human health risk for the frequent-use scenario and a low human health risk for the occasional-use scenario. Neither of these land use scenarios currently occur at the site.

1977 (DOE/RL-93-81-Draft-A) Limited field investigation report for the 100-NR-2 Operable Unit. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008695. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) was conducted to determine the nature and extent of hazardous and radioactive materials present in the groundwater. This information is then used to assess the applicability of interim remedial measures (IRM) for reducing human health and environmental risks within the 100-NR-2 Groundwater Operable Unit which is located in the North-Central part of the Hanford Site. The 100-NR-2 Operable Unit is one of two operable units associated with the 100 N Area. operable unit 100-NR-1 addresses contaminant sources while 100-NR-2 addresses contaminant present in the underlying groundwater. The primary method of investigation used during this LFI was the sampling of existing wells and the installation of one new monitoring well. Samples were collected from the groundwater and soils and submitted for laboratory analysis. The soil samples were screened in the field to ascertain the presence of volatile organic compounds and radionuclides. Results of the soil analysis are presented in the 100-NR-1 Operable Unit LFI Report (DOE-RL 1994a). Analytical data were subjected to validation under the Hanford Resource Conservation and Recovery Act program.

1978 (DOE/RL-93-82-Draft-A) Limited field investigation for the 100-FR-1 Operable Unit. Ayres, J.M. (IT Corp. (United States)). USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1994. 206p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008696. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) report summarizes the data collection and analysis activities conducted during the 100-FR-1 Source Operable Unit LFI and the associated qualitative risk assessment (QRA), and makes recommendations on the continued candidacy of high-priority sites for interim remedial measures (IRM). The results and recommendations presented in this report are generally independent of future land use scenarios. This report is unique in that it is based on Hanford-specific agreements discussed in the Hanford Federal Facility Agreement and Consent Order (Ecology et al. 1990), the Hanford Site Risk Assessment Methodology (DOE-RL 1994a), the RCRA Remedial Investigation/Feasibility Study Work Plan for the 100-FR-1 Operable Unit (DOE-RL 1992a), and the Hanford Past-Practice Strategy (HPPS) (DOE-RL 1991), and must

be viewed in this context. The HPPS, described and justified in The Hanford Federal Facility Agreement and Consent Order Change Package (Ecology et al. 1991), emphasizes initiating and completing waste site cleanup through interim actions. An LFI is required when existing data are insufficient to formulate a conceptual model and perform a QRA. The purpose of the report is to identify those sites that are recommended to remain as candidates for IRM, provide a preliminary summary of site characterization studies, refine the conceptual model as needed, identify contaminant- and location-specific applicable or relevant and appropriate requirements (ARAR), and provide a qualitative assessment of the risks associated with the sites. This assessment includes consideration of whether contaminant concentrations pose an unacceptable risk that warrants action through IRM.

1979 (DOE/RL-93-83) Limited field investigation report for the 100-FR-3 operable unit. USDOE Richland Operations Office, WA (United States). Oct 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007596. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) report is a secondary document summarizing the data collection and analysis activities conducted during the 100-FR-3 Groundwater Operable Unit LFI and the associated qualitative risk assessment (QRA).

1980 (DOE/RL-93-96-Rev.1) 300-FF-1 operable unit remedial investigation phase II report: Physical separation of soils treatability study. Bechtel National, Inc., Richland, WA (United States). Sep 1994. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007602. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the approach and results of physical separations treatability tests conducted at the Hanford site in the north process pond of the 300-FF-1 Operable Unit. Physical separation of soils was identified as an alternative for remediation for which treatability studies were required to demonstrate effectiveness and provide information for the Phase III feasibility study to be submitted to EPA and Ecology by August 15, 1994. Physical separation of soils was identified as a remediation alternative due to the potential to significantly reduce the amount of contaminated soils prior to disposal. The scope of this report is limited to investigations and discussion of tests conducted in the north process pond. However, because contaminated soils are similar in the south process pond, process trenches, scraping area, and sanitary trenches, test results are expected to apply to these sites also.

1981 (DOE/RL-93-98-Rev.1) Pilot-scale treatability test plan for the 200-BP-5 operable unit. Revision 1. Bechtel National, Inc., Richland, WA (United States). Jan 1995. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007601. Source: OSTI; NTIS; INIS; GPO Dep.

The 200 Areas of the Hanford Site are included on the US Environmental Protection Agency (EPA) National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Hanford Site, established in 1943, was originally designed, built, and operated to produce plutonium for nuclear weapons, using production reactors and chemical reprocessing plants. Operations in the 200 Areas involved mainly

separation of special nuclear materials from irradiated nuclear fuel and related chemical and fuel processing and waste management. In general, chemical and low-level radioactive liquid wastes associated with these operations were disposed to the ground through infiltration structures such as cribs, ponds, ditches, and injection wells, resulting in groundwater contamination.

1982 (DOE/RL-93-99-Rev.1) Remedial investigation and feasibility study report for the environmental restoration disposal facility. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 807p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007091. Source: OSTI; NTIS; INIS; GPO Dep.

This remedial investigation/feasibility study (RI/FS) evaluates alternatives for placement of remediation waste generated during remediation of CERCLA past-practice sites on the Hanford Reservation. With the exception of the no action alternative, all of the alternatives evaluated in this RI/FS include a CERCLA landfill referred to as the Environmental Restoration Disposal Facility (ERDF). The ERDF would serve as the receiving facility for most of the waste excavated during remediation of CERCLA past-practice sites. The primary element of the ERDF is a single trench excavated below existing grade that will be filled with remediation waste and closed with a protective surface barrier. Supporting facilities, which may include administrative buildings, railroad spurs, waste off-loading and transport equipment, and decontamination facilities, will also be included as part of the ERDF. Only remediation waste that originates within the Hanford Site will be placed in the ERDF. The waste is expected to consist of dangerous/hazardous wastes, polychlorinated biphenyl (PCB) and asbestos waste, low-level radioactive waste, and low-level mixed waste (containing both dangerous and radioactive waste).

1983 (DOE/RL-94-12) Treatability test plan for the 200-ZP-1 operable unit. USDOE Richland Operations Office, WA (United States). Jul 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007962. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the treatability test plan for pilot-scale pump and treat testing at the 200-ZP-1 Operable Unit. The approach discussed in this treatability test plan is to conduct a pilot-scale pump and treat test for the contaminant plume associated with the 200-ZP-1 Operable Unit. The primary contaminants of concern are carbon tetrachloride, chloroform, and trichloroethylene (TCE). The pilot-scale treatability testing has as its primary purpose to assess the performance of aboveground treatment systems with respect to the ability to remove the primary contaminants present in groundwater withdrawn from the contaminant plume. The overall scope of this test plan includes: description of the pump and treat system to be tested, as well as the test performance objectives and data quality objectives (DQOs) that will be used to evaluate the effectiveness of the pilot-scale treatment system; discussion of the treatment technology to be tested and supporting development activities, including process flow and conceptual design descriptions and equipment, fabrication, utility, and system startup needs; description of pilot-scale treatment system performance, operating procedures, and operational controls, as well as anticipated monitoring activities, analytes, parameters, analytical procedures, and quality assurance

protocols; summaries of other related treatability testing elements, including personnel and environmental health and safety controls, process and secondary waste management and disposition, schedule, and program organization.

1984 (DOE/RL-94-29) State waste discharge permit application: 200 Area Treated Effluent Disposal Facility (Project W-049H). Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003269. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the original Hanford Federal Facility Agreement and Consent Order negotiations, US DOE, US EPA and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground to the Hanford Site are subject to permitting in the State Waste Discharge Permit Program (SWDP). This document constitutes the SWDP Application for the 200 Area TEFDF stream which includes the following streams discharged into the area: Plutonium Finishing Plant waste water; 222-S laboratory Complex waste water; T Plant waste water; 284-W Power Plant waste water; PUREX chemical Sewer; B Plant chemical sewer, process condensate, steam condensate; 242-A-81 Water Services waste water.

1985 (DOE/RL-94-42) Limited field investigation report for the 100-BC-2 Operable Unit. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Nov 1994. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009555. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the limited field investigation and presents the associated qualitative risk assessment (QRA). It provides recommendations on the continued candidacy for interim remedial measures (IRM) for the 3 high-priority waste sites and 11 solid waste burial grounds in this operable unit. Purpose of this report is to summarize the site characterization activities, refine the conceptual exposure model as needed, identify chemical- and location-specific applicable or relevant and appropriate requirements, provide a QRA of risks associated with high-priority sites and a solid waste burial ground, and identify candidate sites for remaining on the IRM path. (The 100-BC-2 Source Operable Unit consists of 1.7 km² (0.6 mi²) within the 100 B/C Area; the operable unit contains waste sites associated with the original plant facilities constructed to support operation of C Reactor and liquid, sludge, and solid waste units.)

1986 (DOE/RL-94-42-Draft-A) 100-BC-2 limited field investigation report. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1994. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009615. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the 100-BC-2 Operable Unit limited field investigation and presents the associated qualitative risk assessment. This report also provides recommendations on the continued candidacy for interim remedial measures (IRM) for the three high-priority waste sites and the 11 solid waste burial grounds in this operable unit. The 100-BC-2 Source Operable Unit consists of an area

about 1.7 km² (0.6 mi²) within the Hanford B/C Area; it contains waste sites associated with the original plant facilities constructed to support the operation of the C Reactor and liquid, sludge, and solid waste units.

1987 (DOE/RL-94-43) 118-B-1 excavation treatability test plan. USDOE Richland Operations Office, WA (United States). Jul 1994. 110p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017333. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford 118-B-1 Burial Ground Treatability Study has been required by milestone change request #M-15-93-04, dated September 30, 1993. The change request requires that a treatability test be conducted at the 100-B Area to obtain additional engineering information for remedial design of burial grounds receiving waste from 100 Area removal actions. This treatability study has two purposes: (1) to support development of the Proposed Plan (PP) and Record of Decision (ROD), which will identify the approach to be used for burial ground remediation, and (2) to provide specific engineering information for receiving waste generated from the 100 Area removal actions. Data generated from this test also will provide critical performance and cost information necessary for remedy evaluation in the detailed analysis of alternatives during preparation of the focused feasibility study (FFS). This treatability testing supports the following 100 Area alternatives: (1) excavation and disposal, and (2) excavation, sorting, (treatment), and disposal.

1988 (DOE/RL-94-43-Rev.1) 118-B-1 Excavation Treatability Test Plan. Revision 1. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Oct 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008221. Source: OSTI; NTIS; INIS; GPO Dep.

The 100 Area of the Hanford Site has been divided into 25 Resource Conservation and Recovery Act (RCRA) Past Practice and Comprehensive Environmental Response Compensation and Liability Act (CERCLA) operable unit (OU) sites based mainly on location. -These sites are very similar in the types of contaminants expected and methods of disposal used. The Hanford 118-B-1 Burial Ground Treatability Study has been required by milestone change request No. M-15-93-04, dated September 30, 1993. The change request requires that a treatability test be conducted at the 100-B Area to obtain additional engineering information for remedial design of burial grounds receiving waste from 100 Area removal actions. This treatability study has two purposes: (1) to support development of the Proposed Plan (PP) and Record of Decision (ROD), which will identify the approach to be used for burial ground remediation, and (2) to provide specific engineering information for receiving waste generated from the 100 Area removal actions. Data generated from this test also will provide critical performance and cost information necessary for remedy evaluation in the detailed analysis of alternatives during preparation of the focused feasibility study (FFS). This treatability testing supports the following 100 Area alternatives: (1) excavation and disposal, and (2) excavation, sorting (treatment), and disposal.

1989 (DOE/RL-94-47-Rev.1) Proposed plan for the Environmental Restoration Disposal Facility (ERDF) at the Hanford Site, Richland, Washington. Revision 1. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Oct

1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008220. Source: OSTI; NTIS; INIS; GPO Dep.

This plan proposes construction and operation of the Environmental Restoration Disposal Facility (ERDF) for disposing waste from cleanup of the Hanford Site. The ERDF is proposed to be a single-trench landfill, capable of receiving only Hanford cleanup waste. The landfill would be closed with a protective cap. The ERDF would include roads, vehicles, a decontamination facility, and other facilities to support waste disposal. The cleanup waste may include soil, rubble, or other materials contaminated with hazardous (chemical), low-level radioactive, or mixed (combined hazardous chemical and radioactive) wastes removed from the Hanford Site. This proposed action would initially authorize construction and operation of two landfill cells capable of receiving approximately 1 million cubic yards of cleanup waste removed from along the Columbia River on the Hanford Site.

1990 (DOE/RL-94-48-Draft-A) 100-KR-4 Operable Unit focused feasibility study report. Todd, M.E. (Bechtel National, Inc., Richland, WA (United States)). USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Oct 1994. 435p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009009. Source: OSTI; NTIS; INIS; GPO Dep.

This focused feasibility study (FFS) report presents the detailed analysis of alternatives for interim remedial measures (IRM) for the 100-KR-4 Operable Unit. The 100-KR-4 Operable Unit is one of four operable units associated with the 100 K Area of the Hanford Site. Three of the operable units (100-KR-1, KR-2, and KR-3) are source units. The 100-KR-4 Groundwater Operable Unit includes the groundwater beneath the source operable units and the adjacent groundwater, surface water, fluvial sediments, and aquatic biota impacted by the overlying source operable unit. Based on the qualitative risk assessment performed for the operable unit, all the contaminants of potential concern (COPC) had incremental cancer risks in the low or very low range ($<1E-4$) under the occasional-use exposure scenario. Therefore, none of these COPC represent an unacceptable human health risk under this exposure scenario.

1991 (DOE/RL-94-53-Draft-A) Limited field investigation report for the 100-HR-2 Operable Unit. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1994. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008318. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the 100-HR-2 Operable Unit investigative phase and the associated qualitative risk assessment (QRA). The 100-HR-2 Operable Unit contains solid waste burial grounds, an ash pit, bum pits, electrical facilities, septic systems, and support facilities. All known and suspected areas of contamination were classified as solid waste burial grounds or low-priority waste sites based on the collective knowledge of the operable unit managers (representatives from the US Department of Energy [DOE], the US Environmental Protection Agency [EPA], and Washington Department of Ecology [Ecology]) during the preparation of the 100-HR-2 Operable Unit work plan (DOE/RL 1993f). Solid waste burial grounds were judged to pose sufficient risk(s), through one or more pathways, to require evaluation for an interim remedial measure (IRM) as per the

Hanford Past-Practice Strategy (HPPS) (DOE/RL 1991) and negotiations with DOE, EPA, and Ecology. An IRM is intended to achieve remedies that are likely to lead to a final record of decision. Low-priority sites are those judged not to pose significant risk to require the streamlined evaluation. There were six low-priority waste sites and seven solid waste burial grounds identified. The investigative phase was conducted in accordance with the RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-2 Operable Unit (DOE/RL 1993f). The QRA was performed in accordance with the Hanford Site Baseline Risk Assessment Methodology (DOE/RL 1993b) and the recommendations incorporate the strategies of the HPPS. The purpose of this report is to: (1) provide a summary of site investigative activities; (2) refine the conceptual exposure model (as needed); (3) identify chemical- and location-specific corrective action requirements; and (4) provide a human health and ecological QRA associated with solid waste burial grounds.

1992 (DOE/RL-94-59-Draft-A) 100-BC-5 operable unit focused feasibility study report. Draft A. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1994. 513p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009557. Source: OSTI; NTIS; INIS; GPO Dep.

This focused feasibility study report presents the detailed analysis of alternatives for both interim remedial measures and potential future actions for the 100-BC-5 operable unit. The limited investigation recommended that the operable unit be removed from the IRM pathway as defined in the Hanford Past-Practice Strategy. The FFS was initiated in support of a final action. In the course of evaluating alternatives, it was recognized that the data were insufficient to support a final action. Consequently, the unit managers decided to complete the document as an interim FFS to document the modeling and evaluation efforts done to date. The potential contaminant of interest in the operable unit for a final action would be Sr-90, with a calculated incremental cancer risk of $2E-06$ based on an occasional-use exposure scenario and which exceeds the Safe Drinking Water Act maximum contaminant level in the near-river wells. The modeling to support the evaluation of alternatives was based on Sr-90 data from groundwater monitoring wells in the operable unit. The 100-BC-5 unit is one of three operable units associated with the 100 B/C Area of the site. Two of the 100 B/C operable units are source units. The 100-BC-5 Groundwater Operable Unit includes the groundwater beneath the source operable units and the adjacent groundwater, surface water, fluvial sediments, and aquatic biota impacted by the overlying source operable unit. The key assumptions which form the basis for the FFS are: addressing an identified threat to human health or the environment; protecting the Columbia River and to abate offsite migration of contaminants; containment and control of contaminant plumes; occasional-use scenario is assumed for the operable unit; a finite lifecycle for the IRM to the year 2008; the 100 Area Feasibility Study Phases 1 & 2 forms the basis for the alternatives evaluated in the FFS; disposal to the Environmental Restoration Disposal Facility is assumed for all solid wastes generated.

1993 (DOE/RL-94-61-Draft-A) 100 Area source operable unit focused feasibility study report. Draft A. USDOE Richland Operations Office, WA (United States). Sep 1994. 236p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007967. Source: OSTI; NTIS; INIS; GPO Dep.

In accordance with the Hanford Past-Practice Strategy (HPPS), a focused feasibility study (FFS) is performed for those waste sites which have been identified as candidates for interim remedial measures (IRM) based on information contained in applicable work plans and limited field investigations (LFI). The FFS process for the 100 Area source operable units will be conducted in two stages. This report, hereafter referred to as the Process Document, documents the first stage of the process. In this stage, IRM alternatives are developed and analyzed on the basis of waste site groups associated with the 100 Area source operable units. The second stage, site-specific evaluation of the IRM alternatives presented in this Process Document, is documented in a series of operable unit-specific reports. The objective of the FFS (this Process Document and subsequent operable unit-specific reports) is to provide decision makers with sufficient information to allow appropriate and timely selection of IRM for sites associated with the 100 Area source operable units. Accordingly, the following information is presented: a presentation of remedial action objectives; a description of 100 Area waste site groups and associated group profiles; a description of IRM alternatives; and detailed and comparative analyses of the IRM alternatives.

1994 (DOE/RL-94-62-Draft-A) 100-BC-1 Operable Unit focused feasibility study. Day, R.E. (Bechtel National, Inc., Richland, WA (United States)). USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). [1994]. 167p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008317. Source: OSTI; NTIS; INIS; GPO Dep.

The standard Comprehensive Environmental Response, Compensation, and Liability Act feasibility study includes development and screening of alternatives (Phases 1 and 2) and the detailed analysis of alternatives (Phase 3). This focused feasibility study constitutes the Phase 3 portion of the feasibility study process for the remedial alternatives initially developed and screened in the 100 Area Feasibility Study Phases 1 and 2 (DOE-RL 1993a). The focused feasibility study process is conducted in two stages, a Process Document (DOE-RL 1994a) and an operable unit-specific focused feasibility study document, such as this one. The focused feasibility study process is performed by implementing a "plug-in" style approach; as defined in greater detail in the Process Document, which is a companion to this document. The objective of this focused feasibility study is to provide decision makers with sufficient information to allow appropriate and timely selection of interim remedial measures for candidate waste sites associated with the 100-BC-1 Operable Unit which is located in the north-central part of the Hanford Site. The interim remedial measure candidate waste sites are determined in the Limited Field Investigation (DOE-RL 1993b). Site profiles are developed for each of these waste sites. The site profiles are used in the application of the plug-in approach. The waste site either plugs into the analysis of the alternatives for the group, or deviations from the developed group alternatives are described and documented.

1995 (DOE/RL-94-63-Draft-A) 100-HR-1 Operable Unit focused feasibility study report. Draft A. USDOE Richland Operations Office, WA (United States). Sep 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007968. Source: OSTI; NTIS; INIS; GPO Dep.

The standard Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Feasibility Study (FS) includes development and screening of alternatives (phases 1 and 2) and the detailed analysis of alternatives (phase 3). This focused feasibility study (FFS) constitutes the phase 3 portion of the FS process. The FFS process is conducted in two stages, a Process Document (DOE-RL 1994a) and an operable unit-specific FFS document, such as this one. The FFS process is performed by implementing a "plug-in" style approach as defined in great detail in the Process Document. The objective of this operable unit-specific FFS is to provide decision makers with sufficient information to allow appropriate and timely selection of interim remedial measures (IRM) for sites associated with the 100-HR-1 Operable Unit. The IRM candidate waste sites are determined in the limited field investigation. Site profiles are developed for each of these waste sites. The site profiles are used in the application of the plug-in approach. The waste site either plugs into the analysis of the alternatives for the group, or deviations from the developed group alternatives are described and documented.

1996 (DOE/RL-94-64-Draft-A) 100-DR-1 operable unit focused feasibility study report. Bechtel National, Inc., Richland, WA (United States). Sep 1994. 179p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008219. Source: OSTI; NTIS; INIS; GPO Dep.

This 100-DR-1 Operable Unit-specific focused feasibility study (FFS) is prepared in support of a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI)/corrective measures study (CMS) for the 100-DR-1 Operable Unit. The 100 Area Sources Operable Unit Focused Feasibility Study Report (DOE-RL 1994a), otherwise referred to as the Process Document, is a required reference document to this operable unit-specific focused feasibility study, which together provide a complete detailed analysis of remedial alternatives. The approach for the RFI/CMS activities for the 100 Area has been defined in the Hanford Past-Practice Strategy (HPPS) (DOE-RL 1991). The HPPS emphasizes integration of the results of ongoing site characterization activities into the decision making process at the earliest point practicable (observational approach) and expedites the remedial action process by emphasizing the use of interim actions (DOE-RL 1991).

1997 (DOE/RL-94-65-Draft-A) 100-HR-2 Operable Unit Focused Feasibility study report. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jan 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008222. Source: OSTI; NTIS; INIS; GPO Dep.

The standard Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Feasibility Study (FS) includes development and screening of alternatives (Phases 1 and 2) and the detailed analysis of alternatives (Phase 3). This focused feasibility study (FFS) was conducted for the 100-HR-2 Operable Unit (OU) at the Hanford Site in southeastern Washington. This FFS constitutes the Phase 3 portion of the FS process for the remedial alternatives initially developed and screened in the 100 Area Feasibility Study Phases 1 and 2 (DOE-RL 1993a). The objective of this OU-specific FFS is to provide decision makers with sufficient information to allow appropriate and timely selection of interim remedial measures (IRM) for the seven IRM candidate sites associated with the 100-HR-2 OU. The

IRM candidate waste sites identified in Table ES-1 are determined in the limited field investigation (DOE-RL 1994b). Site profiles are developed for each of these waste sites. The site profiles are used in the application of the plug-in approach. The waste site either plugs into the analysis of the alternatives for the group, or deviations from the developed group alternatives are described and documented. A summary for the 100-HR-2 IRM candidate waste site is as follows: none of the waste sites require additional alternative development. six of the seven waste sites directly plug into the waste site group alternatives. The site-specific detailed analysis is conducted, referencing the waste site group analysis as appropriate. A waste site detailed analysis summary is presented in Table ES-1. A comparative analysis of remedial alternatives is presented for each waste site. A summary of the comparative analysis is presented in Table ES-2.

1998 (DOE/RL-94-66-Draft-A) 100-KR-1 Operable Unit focused feasibility study report. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Nov 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008217. Source: OSTI; NTIS; INIS; GPO Dep.

The standard Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Feasibility Study (FS) includes development and screening of alternatives and the detailed analysis of alternatives. This focused feasibility study (FFS) was conducted for the 100-KR-1 Operable Unit at the Hanford Site in southeastern Washington. The objective of this operable unit-specific FFS is to provide decision makers with sufficient information to allow appropriate and timely selection of interim remedial measures (IRM) for the five sites (116-K-1 crib, 116-K-2 trench, 116-KE-4 and 116-KW-3 retention basins, and process effluent pipelines) associated with the 100-KR-1 Operable Unit. The IRM candidate waste sites are determined in the limited field investigation. Site profiles are developed for each of these waste site. The site profiles are used in the application of the plug-in approach. The waste site either plugs into the analysis of the alternatives for the group, or deviations from the developed group alternatives are described and documented.

1999 (DOE/RL-94-67-Draft-A) 100-HR-3 Operable Unit focused feasibility study report. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1994. 707p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008319. Source: OSTI; NTIS; INIS; GPO Dep.

This focused feasibility study (FFS) is in support of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial investigation/feasibility study (RI/FS) activities for the 100-HR-3 Groundwater Operable Unit. The RI/FS process is described in the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988). The 100 Area is one four areas on the Hanford Site that are on the US Environmental Protection Agency's (EPA) National Priorities List (NPL) under CERCLA (Figure 1-1). The 100-HR-3 Operable Unit is one of seven operable units associated with the 100 D/DR and 100 H Areas of the Hanford Site (Figure 1-2). Three of the 100 D/DR operable units (100-DR-1, DR-2, and DR-3), two of the 100 H operable units (100-HR-1 and HR-2), and the 100-IU-4 Operable Unit are source units. The

100-HR-3 Groundwater Operable Unit includes the groundwater beneath the source operable units and the adjacent groundwater, surface water, fluvial sediments, and aquatic biota impacted by the overlying source operable unit. The 100-H Operable Unit also includes that portion of the 600 Area that lies between the D/DR and Reactors. The approach for the RI/FS activities for the 100 Area operable units has been further defined in the Hanford Past-Practice Strategy (DOE-RL 1991). This strategy streamlines past-practice remedial action process with a bias for action through optimizing the use of interim remedial measures (IRM) and expedited response actions (ERA). All work conducted at the 100 Area waste sites is in accordance with the conditions set forth in the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al. 1990), and its amendments, signed by the Washington State Department of Ecology (Ecology), EPA, and the US Department of Energy (DOE).

2000 (DOE/RL-94-96) Hanford Site Pollution Prevention Plan Progress report, 1993. USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States). Aug 1994. 132p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018685. Source: OSTI; NTIS; INIS; GPO Dep.

This report tracks progress against the goals stated in the Hanford Site 5-year Pollution Prevention Plan. The executive summary of the plan was submitted to the Washington State Department of Ecology (Ecology) in September 1992. The plan, executive summary, and the progress reports are elements of a pollution prevention planning program that is required by Washington Administrative Code (WAC) 173-307 for all hazardous substance users and/or all hazardous waste generators regulated by Ecology. These regulations implement Chapter 70.95C, Revised Code of Washington, an act relating to hazardous waste reduction. The act encourages voluntary efforts to redesign industrial processes to help reduce or eliminate hazardous substances and hazardous waste byproducts, and to maximize the inprocess reuse or reclamation of valuable spent material. Although the Hanford Site is exempt, it is voluntarily complying with this state regulatory-mandated program. This is the first year the Hanford Site is submitting a progress report. It covers calendar year 1993 plus the last quarter of 1992. What is reported, in accordance with WAC 173-307, are reductions in hazardous substance use and hazardous waste generated. A system of Process Waste Assessments (PWA) was chosen to meet the requirements of the program. The PWAs were organized by a physical facility or company organization. Each waste-generating facility/organization performed PWAs to identify, screen, and analyze their own reduction options. Each completed PWA identified any number of reduction opportunities, that are listed individually in the plan and summarized by category in the executive summary. These opportunities were to be implemented or evaluated further over the duration of the 5-year plan. The basis of this progress report is to track action taken on these PWA reduction opportunities in relationship to achieving the goals stated in the Pollution Prevention Plan.

2001 (DOE/RL-94-99-Draft-A) Proposed Plan for Interim Remedial Measures at the 100-BC-1 Operable Unit. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007982. Source: OSTI; NTIS; INIS; GPO Dep.

This Proposed Plan introduces the Interim Re Measures (IRM) for addressing contaminated soil at the 100-BC-1 Operable Unit, located at the Hanford Site. In addition, this plan includes a summary of other alternatives analyzed and considered for the 100-BC-1 Operable Unit, and provides the public with information for participating in the decisionmaking process. This document notifies the public of when and how to be involved in the process. It is issued jointly by the US Environmental Protection Agency (EPA), as the lead regulatory agency; the Washington State Department of Ecology (Ecology), as the support agency; and the US Department of Energy (DOE), as the responsible agency.

2002 (DOE/RL-94-100-Draft-A) Proposed plan for interim remedial measures at the 100-DR-1 Operable Unit, Hanford Site, Richland, Washington. Draft A. USDOE Richland Operations Office, WA (United States). Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007981. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan introduces the preferred alternative for addressing contaminated soil and solid waste at the 100-DR-1 Operable Unit, located at the Hanford Site, along the Columbia River. In addition, this plan includes a summary of other alternatives analyzed for the 100-DR-1 Operable Unit. The DOE conceived and implemented the Environmental Restoration Program in response to the 100 Areas being placed on the National Priorities List. The objective of the Environmental Restoration Program is remediation of the contaminated waste sites in the 100 Areas in accordance with applicable regulations. The Environmental Restoration Program proposes using past-practice waste site and groundwater remediation, along with reactor and facility decontamination and demolition, to prepare the 100 Areas for delisting from the Superfund National Priorities List. The 100-DR-1 Operable Unit includes liquid and sludge disposal and solid waste sites generally associated with operation of the D and DR reactors.

2003 (DOE/RL-94-101-Draft-A) Proposed plan for Interim remedial measures at the 100-HR-1 Operable Unit, Hanford Site, Richland, Washington. Draft A. USDOE Richland Operations Office, WA (United States). Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007979. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan introduces the interim remedial measures for addressing contaminated soil at the 100-HR-1 Operable Unit, located at the Hanford Site. In addition, this plan includes a summary of other alternatives analyzed and considered for the 100-HR-1 Operable Unit. The EPA, DOE, and Washington State Dept. of Ecology believe that a combination of removal, treatment, and disposal technologies, where appropriate, would significantly reduce the potential threats to human health and the environment at the 100-HR-1 Operable Unit high-priority waste sites. The remedial actions described in this proposed plan are designed to minimize human health and ecological risks and ensure that additional contaminants originating from these waste sites are not transported to the groundwater. The 100-HR-1 Operable Unit contains the retention basin for the H reactor cooling system, process effluent trenches, the Pluto crib which received an estimated 260 gallons of radioactive liquid waste, process effluent pipelines, and solid waste sites used for the burial of decontaminated and decommissioned equipment from other facilities. Potential health threats

would be from the isotopes of cesium, cobalt, europium, plutonium, and strontium, and from chromium, arsenic, lead, and chysene.

2004 (DOE/RL-94-102-Draft-A) Proposed plan for interim remedial measure at the 100-HR-3 Operable Unit, Hanford Site, Richland, Washington. Draft A. USDOE Richland Operations Office, WA (United States). Sep 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007980. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan introduces the interim remedial measure for addressing groundwater contamination at the 100-HR-3 Operable Unit, located at the Hanford Site, along the Columbia River. In addition, this plan includes a summary of other alternatives analyzed for the 100-HR-3 Operable Unit. The 100 Areas of the Hanford Site were placed on the Superfund National Priorities List (NPL) on November 3, 1989, because of soil and groundwater contamination resulting from the past operation of nuclear facilities. The preferred alternative described here is Institutional Control/Continued Current Actions. This alternative includes continued operation and evaluation of the Pilot-Scale Treatability Study located in the 100 D/DR Area, further evaluation of ecological risks through the Columbia River Comprehensive Impact Assessment, continued application of institutional controls and groundwater monitoring. Three areas make up the 100-HR-3 Operable Unit: 100 H Reactor area; 100 D/DR Reactor area; and the area between the H and D/DR reactors. Chromium is the main contaminant of concern in the groundwater below this area and is thought to be causing adverse impacts to the Columbia River and surrounding habitat.

2005 (DOE/RL-94-107) Radioactive air emissions program notice of construction for the decommissioning of the 233-S plutonium concentration facility complex. Bechtel National, Inc., Richland, WA (United States). Sep 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007976. Source: OSTI; NTIS; INIS; GPO Dep.

This Notice of Construction (NOC) presents the required information regarding Phase I and II of the decommissioning of the 233-S Plutonium Concentration Facility Complex. Phase II includes dismantling and removing the structure and final site stabilization. The project will include techniques that minimize the volume of the waste, which will result in lower waste hazard classifications.

2006 (DOE/RL-94-107-Rev.1) Radioactive air emissions program notice of construction for the decommissioning of the 233-S Plutonium Concentration Facility Complex. Revision 1. USDOE Richland Operations Office, WA (United States); Bechtel Hanford, Inc., Richland, WA (United States). Oct 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007975. Source: OSTI; NTIS; INIS; GPO Dep.

This Notice of Construction (NOC) presents the required information regarding Phase 1 and 2 of the decommissioning of the 233-S Plutonium Concentration Facility Complex (233-S Complex). Phase 1 includes preparing the site, setting up temporary containments where required, removing inventory and equipment, and final decontamination of the structure. Phase 2 includes dismantling and removing the structure and final site stabilization. The project will include

techniques that minimize the volume of the waste. Radioisotopes found include neptunium 237, plutonium 237, 238, 239, 240, 241, and 242, and americium 241. The 233-S building was designed and operated to concentrate the plutonium solutions generated by the REDOX Plant using an ion-exchange process. The process was expanded in 1962 to include neptunium received from the REDOX Plant.

2007 (DOE/RL-94-108) Radioactive air emissions notice of construction for the decommissioning of the 190-D Complex. USDOE Richland Operations Office, WA (United States). Oct 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007978. Source: OSTI; NTIS; INIS; GPO Dep.

This Notice of Construction (NOC) presents the proposed plan for the decommissioning of the 190-D Complex. The proposed action would demolish the 190-D Complex, as it is no longer in suitable condition for use, and no longer supports a mission. The structure poses a safety hazard to the workers required to perform surveillance and maintenance. This action would eliminate the need to maintain the structure, remove a safety hazard to workers, and help to achieve the environmental restoration goals for the Hanford Site. This facility was originally one of the D Reactor support buildings, which was a nonradioactive facility, and supplied coolant water to the reactor. It was later modified to serve as a research and development laboratory. Uranium fuel element experiments were conducted in the test loops from the 1960's to the 1980's.

2008 (DOE/RL-94-112-Draft-A) Proposed plan for interim decision at the 100-BC-5 operable unit, Hanford Site, Richland, Washington. Draft A. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008180. Source: OSTI; NTIS; INIS; GPO Dep.

This Proposed Plan introduces the proposed decision for addressing Groundwater during the interim period at the 100-BC-5 Operable Unit, located at the Hanford Site along the Columbia River. This document is made available for public review and comment by the U.S. Environmental Protection Agency (EPA) as lead agency, the Washington State Department of Ecology as a support agency, and the U.S. Department of Energy (DOE) as the responsible agency.

2009 (DOE/RL-94-113) Security Transition Program Office; progress report. Nounson, P.A. Department of Energy, Richland, WA (United States). Richland Operations Office. Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). (PNL-10132). Order Number DE95001852. Source: OSTI; NTIS; GPO Dep.

This report documents the progress made by the Hanford security transition in which the Security Transition Program Office (STPO) has participated since its inception on September 9, 1992. The STPO was organized as a short-lived (two year) program office, targeted at a special goal, the significant change in operations of safeguards and security through process improvement. Comprised of a team from the Department of Energy Richland Operations Office (RL) and the Hanford contractors, the security transition began with a vision to change the Hanford Safeguards and Security program from a large paramilitary organization that supported the national defense mission to an industrial-style organization that supports environmental cleanup. The industrial security foundation continues to be supplemented to

protect material interests and information resources requiring critical asset protection.

2010 (DOE/RL-94-113-Draft-A) Proposed plan for interim remedial measure at the 100-KR-4 Operable Unit, Hanford Site, Richland, Washington. Draft A. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008182. Source: OSTI; NTIS; INIS; GPO Dep.

This Proposed Plan introduces the preferred alternative for interim remedial action to address ground water contamination at the 100-KR-4 Operable Unit, located along the Columbia River. In addition, this plan includes a summary of other interim Remedial Alternatives. Information summarized in this plan can be found in greater detail in the 100-KR-4 Feasibility Study Report as well as a variety of other documents (listed). The 100-K area was the site for two water-cooled graphite-moderated plutonium production reactors (1955-1970, 1955-1971), which produced plutonium for nuclear weapons and used Columbia River water for cooling and other operations. Liquid waste disposal is the primary concern because it is believed to have created plumes of contamination in ground water centered near the two reactors and along the 116-K-2 Trench.

2011 (DOE/RL-94-127) U.S. Department of Energy, Richland Operations Office Environmental Protection Implementation Plan, November 9, 1994 to November 9, 1995. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002951. Source: OSTI; NTIS; INIS; GPO Dep.

The defence production mission at the Hanford Sites has ceased, and treatment, storage, and disposal of existing waste and cleanup of the waste sites is now the major effort. Hanford Site's current mission is focused on three mission elements: site cleanup; technology development; economic diversification. The goal of US DOE is to clean up waste sites at the Hanford Reservation and bring the facilities into compliance with federal, state, and local environmental laws by 2028. This document provides information about the environmental protection implementation plan.

2012 (DOE/RL-94-131) Letter report for skyshine abatement assessment. Department of Energy, Richland, WA (United States). Richland Operations Office. Mar 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009011. Source: OSTI; NTIS; INIS; GPO Dep.

The term "skyshine," as used in this report, refers to radiation that originates from the 1301-N/1 325-N Liquid Waste Disposal Facilities (LWDF) and reflects back to the surrounding 100 N Area. Skyshine was first observed in 1980 by 100 N Area operators who were able to correlate elevated radiation readings with the amount of water shielding over 1301-N (i.e., depth of water maintained over 1301-N). Since 1980, measures have been taken to hold the errant radiation in abeyance. The most prominent of those measures are the concrete panels that reside atop 1301-N and 1325-N. This letter report has been issued in support of the overall 100 N Area strategy to address whether the effects of skyshine adversely impact the public who may pass by 1301-N/1325-N in the course of traveling along the Columbia River, or who trespass on the southeastern bank. The most likely trespassers are those who may fish or camp on the 100 N Area shoreline. Although the public is legally

prohibited from trespassing along the shoreline, it is possible for the public to gain access to the 100 N Area shoreline. It is legal for the public to boat along the 100 N Area shoreline. In response to this concern, Tri-Party Agreement (TPA) Milestone M-16-12 was established. This report addresses whether a pre-remedial action for abatement of skyshine from 1301-N/1325-N is necessary to protect the general public prior to implementing the 1301-N/1325-N Closure Plan/Corrective Measure Study. The term "pre-remedial action" is used in this report because remedial actions for final site closure will be addressed in the 1301-N/1325-N Closure Plan/Corrective Measure Study. Skyshine from 1301-N/1325-N may have an effect on 100 N Area workers; however, such exposures are being addressed in numerous other ways such as Hanford Site safety procedures, the 1301-N/1325-N Closure Plan/Corrective Measure Study, and the 100-NR-1-Closure Measure Study.

2013 (DOE/RL-94-131-Draft-A) Letter report for skyshine abatement assessment. Draft A. Bechtel National, Inc., Richland, WA (United States). Oct 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008181. Source: OSTI; NTIS; INIS; GPO Dep.

The term skyshine, as used in this report, refers to radiation originating from the 1301-N/1325-N Liquid Waste Disposal Facilities (LWDF) and reflecting back to the surrounding 100 N Area. Skyshine was first observed in 1980 by 100 N Area shielding over 1301-N (i.e., depth of water maintained over 1301-N). Since 1980, measures have been taken to hold the errant radiation in abeyance. The most prominent of those measures are the concrete panels that currently reside atop 1301-N and 1325-N. This letter report has been issued in support of the overall 100 N Area strategy to address whether the effects of skyshine adversely impact the public who may pass near 1301-N/1325-N or those who trespass upon the area, in the course of traveling along the Columbia River or its southeastern bank near the 100 N Area. The most likely trespasser are those who may fish or camp on the 100 N Area shoreline. Although the public is legally prohibited from occupying the shoreline it is possible that the public could physically gain access to the 100 N Area shoreline. In response to this concern, Tri-Party Agreement milestone M-16-12 was established. This report addresses whether abatement of skyshine is necessary to protect the general public prior to implementing the 1301-N/1325-N Closure Plan/Corrective Measure.

2014 (DOE/RL-94-135-Draft-A) Proposed plan for interim remedial measures at the 100-HR-2 Operable Unit. Draft A. Bechtel National, Inc., Richland, WA (United States). Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008205. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for interim remedial measures for addressing contaminated solid waste at the 100-HR-2 Operable Unit on the Hanford site. This plan also contains a summary of other alternatives analyzed and considered for remedial action in this unit. The H reactor is a former DOE plutonium production nuclear reactor, in operation between 1949 and 1965.

2015 (DOE/RL-94-145-Draft-B) 100 area source operable unit focused feasibility study report: Sensitivity analysis report addendum. Draft B. Bechtel National, Inc., Richland, WA (United States). Dec 1994. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-93RL12367. Order Number DE95008178. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an addendum to the 100 Area Source Operable Unit Focused Feasibility Study Report (DOE-RL-1994b), hereafter referred to as the Process Document. As an addendum, this report further develops the focused feasibility study (FFS) analysis to show the potential impacts of additional exposure scenarios.

2016 (DOE/RL-94-151) Approach and plan for cleanup actions in the 100-KR-2 operable unit of the Hanford site. Bechtel National, Inc., Richland, WA (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008183. Source: OSTI; NTIS; INIS; GPO Dep.

A new administrative approach is being proposed to reach a cleanup decision for the 100-KR-2 Operable Unit. The unit, located at the 100-K Area, contains both liquid and solid waste sites and is one of the remaining operable units scheduled for characterization and cleanup in the 100 Area. Substantial information has been gained over the past 3 years in previous 100 Area operable units, which will be used to help make decisions on the 100-KR-2 Operable Unit. This Focus Package has two purposes: to describe the new approach and activities needed to reach a decision on cleanup actions for the 100-KR-2 Operable Unit, and to invite public participation into the planning process.

2017 (DOE/RL-94-152) Closure report for the N Reactor Facility. USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Mar 1995. 208p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008697. Source: OSTI; NTIS; INIS; GPO Dep.

The N Reactor Closure Report has been prepared to satisfy Section 3156(b) of Public Law 101-189 (Reports in Connection with Permanent Closures of Department of Energy Defense Nuclear Facilities), which requires submittal of a Closure Report to Congress by the Secretary of Energy upon the permanent cessation of production operations at a U.S. Department of Energy defense nuclear facility. Section 3156(a) of Public Law 101-189, regarding training and job placement services for N Reactor personnel, was satisfied by a letter (August 1, 1991) from the Secretary of Energy to the Committees on Armed Services of the Senate and House of Representatives (Watkins 1991). As specified in Section 3156(b) of Public Law 101-189, this closure report provides the following: a complete survey of the environmental problems at the facility; budget quality data indicating the cost of environmental restoration and other remediation and cleanup efforts at the N Reactor facility; and a proposed cleanup methodology and schedule.

2018 (DOE/RL-95-05) Radioactive air emissions notice of construction for the decontamination and closure of the 183-H Solar Evaporation Basins. Nickels, J.M. Bechtel National, Inc., Richland, WA (United States). Jan 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008185. Source: OSTI; NTIS; INIS; GPO Dep.

A Notice of Construction (NOC) is required by the Washington State Department of Health (DOH), pursuant to Washington Administrative Code (WAC) Chapter 246-247-060, for any proposed construction or modification of an existing registered or unregistered emissions unit. The following document is the NOC application to be submitted to

the DOH for the establishment of a new environmental analytical laboratory at the 100-N Area on the Hanford Site. The environmental analytical laboratory will contain a radioactive air emissions unit.

2019 (DOE/RL-95-24) Mitigation action plan for the Environmental Restoration Disposal Facility. Bechtel National, Inc., Richland, WA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008179. Source: OSTI; NTIS; INIS; GPO Dep.

This Mitigation Action Plan describes the mitigation actions for the Environmental Restoration Disposal Facility (ERDF). "Mitigation" is defined in the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), at Code of Federal Regulations, (CFR) Part 40, CFR 1508.20, as including one or more of the following actions: Avoiding the impact altogether by not taking a certain action or parts of an action; Minimizing impacts by limiting the degree or magnitude of the action and its implementation; Rectifying the impact by repairing, rehabilitating, or restoring the affected environment; Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and Compensating for the impact by replacing or providing substitute resources or environments.

2020 (DOE/RL-95-27) Closure proposal: 183-H Solar Evaporation Basins. Bechtel National, Inc., Richland, WA (United States). Feb 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008184. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the overall approach and logic for implementing clean closure of the 183-H Solar Evaporation basins (183-H) in a cost-effective and timely manner and in accordance with all applicable regulations. The Resource Conservation and Recovery Act of 1976 and the Washington Administrative Code (WAC) 173-303 are the regulatory bases for this closure strategy. The closure described herein is consistent with potential future land uses, and with remedial action planning in the 100-H area, as well as with other decontamination and decommissioning (D&D) of the 100-H structures.

2021 (EGG-11265-1069) A multispectral scanner survey of the Salmon Site and surrounding area, Lamar County, Mississippi. Blohm, J.D.; Brewster, S.B. Jr.; Shines, J.E. EG and G, Inc., Las Vegas, NV (United States). Remote Sensing Lab. Jun 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. Order Number DE94019134. Source: OSTI; NTIS; GPO Dep.

An airborne multispectral scanner survey was conducted over the Salmon Site and the surrounding area in Lamar County, Mississippi, on May 8, 1992. Twelve-channel daytime multispectral data were collected from altitudes of 2,000 feet, 4,000 feet, and 6,000 feet above ground level. Large-scale color photography was acquired simultaneously with the scanner data. Three different composite images have been prepared to demonstrate the digital image enhancement techniques that can be applied to the data. The data that were acquired offer opportunity for further standard and customized analysis based on any specific environmental characterization issues associated with this site.

2022 (EGG-EES-11478) Seismic evidence of conjugate normal faulting: The 1994 Devil Canyon earthquake

sequence near Challis, Idaho. Jackson, S.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002052. Source: OSTI; NTIS; INIS; GPO Dep.

In this study, the term "conjugate" refers to faults that occur in two intersecting sets and coordinated kinematically, with each set being distinctive in both orientation and sense of shear (Davis, 1984). Contemporaneous activity along the conjugate faults is defined as occurring within the time frame of the mainshock-aftershock sequence (three weeks for this sequence and generally less than one month in other observed cases). Detailed recordings of microearthquakes from a dense array of temporary analog seismic stations are analyzed. The focal mechanisms and hypocenter spatial and temporal characteristics are combined with geological information to assess the style, geometry, timing, kinematics, and mechanics of conjugate normal faulting. The characteristics of conjugate normal faulting observed in the Devil Canyon sequence are compared to other conjugate normal faulting sequences, and strike-slip and thrust conjugate sequences worldwide.

2023 (EGG-RAAM-11376) Decontamination & Decommissioning Equipment Tracking System (DDETS). Cook, S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab. Jul 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002004. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.

At the request of the Department of Energy (DOE)(EM-50), the Scientific Computing Unit developed a prototype system to track information and data relevant to equipment and tooling removed during decontamination and decommissioning activities. The DDETS proof-of-concept tracking system utilizes a one-dimensional (1D) and two-dimensional (2D) bar coding technology to retain and track information such as identification number, manufacturer, requisition information, and various contaminant information, etc. The information is encoded in a bar code, printed on a label and can be attached to corresponding equipment. The DDETS was developed using a proven relational database management system which allows the addition, modification, printing, and deletion of data. In addition, communication interfaces with bar code printers and bar code readers were developed. Additional features of the system include: (a) Four different reports available for the user (REAPS, transaction, and two inventory), (b) Remote automated inventory tracking capabilities, (c) Remote automated inventory tracking capability (2D bar codes allow equipment to be scanned/tracked without being linked to the DDETS database), (d) Edit, update, delete, and query capabilities, (e) On-line bar code label printing utility (data from 2D bar codes can be scanned directly into the data base simplifying data entry), and (f) Automated data backup utility. Compatibility with the Reportable Excess Automated Property System (REAPS) to upload data from DDETS is planned.

2024 (EGG-WM-10774-Rev.2) Safety analysis report for the Waste Storage Facility. Revision 2. Bengston, S.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. 328p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002039. Source: OSTI; NTIS; GPO Dep.

This safety analysis report outlines the safety concerns associated with the Waste Storage Facility located in the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory. The three main objectives of the report are: define and document a safety basis for the Waste Storage Facility activities; demonstrate how the activities will be carried out to adequately protect the workers, public, and environment; and provide a basis for review and acceptance of the identified risk that the managers, operators, and owners will assume.

2025 (EGG-WM-10877-Rev.1) Waste Management Facilities Cost Information for transportation of radioactive and hazardous materials. Revision 1. Feizollahi, F. (Morrison Knudsen Corp., San Francisco, CA (United States)); Shropshire, D.; Burton, D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002022. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains transportation costs for most types of DOE waste streams: low-level waste (LLW), mixed low-level waste (MLLW), alpha LLW and alpha MLLW, greater-than-Class C (GTCC) LLW and DOE equivalent waste, transuranic waste (TRU), spent nuclear fuel (SNF), and hazardous waste. Unit rates for transportation of contact-handled (<200 mrem/hr contact dose) and remote-handled (>200 mrem/hr contact dose) radioactive waste have been estimated previously, and a summary has been included in earlier WMFCI reports. In order to have a single source for obtaining transportation cost for all radioactive waste, the transportation costs for the contact- and remote-handled wastes are repeated in this report. Land transportation of radioactive and hazardous waste is subject to regulations promulgated by DOE, the US Department of Transportation (DOT), the US Nuclear Regulatory Commission (NRC), and state and local agencies. The cost estimates in this report assume compliance with applicable regulations. It should be noted that the trend is toward greater restrictions on transportation of radioactive waste (e.g., truck or rail car speed, shipping route, security escort, and personnel training requirements), which may have a significant impact on future costs.

2026 (EGG-WM-10924) INEL D&D Long-Range Plan. Buckland, R.J.; Kenoyer, D.J.; Preussner, D.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1993. 259p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94010706. Source: OSTI; NTIS; INIS; GPO Dep.

This Long-Range Plan presents the Decontamination and Decommissioning (D&D) Program planning status for facilities at the Idaho National Engineering Laboratory (INEL). The plan provides a general description of the D&D Program objectives, management criteria, and philosophy; discusses current activities; and documents the INEL D&D Program cost and schedule estimate projections for the next 15 years. appendices are included that provide INEL D&D project historical information and a comprehensive descriptive summary of each current surplus facility.

2027 (EGG-WM-11467) Hazards assessment for the Waste Experimental Reduction Facility. Calley, M.B.; Jones, J.L. Jr. EG and G Idaho, Inc., Idaho Falls, ID (United States). 19 Sep 1994. 175p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570.

Order Number DE95002019. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the hazards assessment for the Waste Experimental Reduction Facility (WERF) located at the Idaho National Engineering Laboratory, which is operated by EG&G Idaho, Inc., for the US Department of Energy (DOE). The hazards assessment was performed to ensure that this facility complies with DOE and company requirements pertaining to emergency planning and preparedness for operational emergencies. DOE Order 5500.3A requires that a facility-specific hazards assessment be performed to provide the technical basis for facility emergency planning efforts. This hazards assessment was conducted in accordance with DOE Headquarters and DOE Idaho Operations Office (DOE-ID) guidance to comply with DOE Order 5500.3A. The hazards assessment identifies and analyzes hazards that are significant enough to warrant consideration in a facility's operational emergency management program. This hazards assessment describes the WERF, the area surrounding WERF, associated buildings and structures at WERF, and the processes performed at WERF. All radiological and nonradiological hazardous materials stored, used, or produced at WERF were identified and screened. Even though the screening process indicated that the hazardous materials could be screened from further analysis because the inventory of radiological and nonradiological hazardous materials were below the screening thresholds specified by DOE and DOE-ID guidance for DOE Order 5500.3A, the nonradiological hazardous materials were analyzed further because it was felt that the nonradiological hazardous material screening thresholds were too high.

2028 (ES/ER/TM-35/R1) An introductory guide to uncertainty analysis in environmental and health risk assessment. Environmental Restoration Program. Hammonds, J.S.; Hoffman, F.O.; Bartell, S.M. Senes Oak Ridge, Inc., TN (United States). Dec 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008097. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents guidelines for evaluating uncertainty in mathematical equations and computer models applied to assess human health and environmental risk. Uncertainty analyses involve the propagation of uncertainty in model parameters and model structure to obtain confidence statements for the estimate of risk and identify the model components of dominant importance. Uncertainty analyses are required when there is no a priori knowledge about uncertainty in the risk estimate and when there is a chance that the failure to assess uncertainty may affect the selection of wrong options for risk reduction. Uncertainty analyses are effective when they are conducted in an iterative mode. When the uncertainty in the risk estimate is intolerable for decision-making, additional data are acquired for the dominant model components that contribute most to uncertainty. This process is repeated until the level of residual uncertainty can be tolerated. Analytical and numerical methods for error propagation are presented along with methods for identifying the most important contributors to uncertainty. Monte Carlo simulation with either Simple Random Sampling (SRS) or Latin Hypercube Sampling (LHS) is proposed as the most robust method for propagating uncertainty through either simple or complex models. A distinction is made between simulating a stochastically varying assessment endpoint (i.e., the distribution of individual risks in an exposed population) and quantifying uncertainty due to lack of knowledge about a fixed but unknown quantity (e.g., a

specific individual, the maximally exposed individual, or the mean, median, or 95%-tile of the distribution of exposed individuals). Emphasis is placed on the need for subjective judgement to quantify uncertainty when relevant data are absent or incomplete.

2029 (FEMP-2314) Meeting the requirements for a DOE environmental restoration project. The Fernald strategy. Vanoss, R.L. (Jacobs Engineering Group, Inc., Pasadena, CA (United States)); Risenhoover, G.M. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940632-23: Annual meeting and exhibition of the Air and Waste Management Association, Cincinnati, OH (United States), 19-24 Jun 1994). Order Number DE94015812. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration (ER) of five Operable Units (OU) at Fernald Environmental Management Project (FEMP) includes compliance with the requirements of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Resource Conservation Recovery Act (RCRA), National Environmental Policy Act (NEPA), and DOE Orders. Each regulatory driver has differing procedural requirements for documenting calculations, decisions, and actions involved in site cleanup. Integration of documentation and avoidance of duplication can save time and money. Such savings are being achieved by OU specific application of supporting studies, revised procedures, and guidance documents. Each OU is seeking appropriate opportunities to produce single documents that simultaneously fulfill the important requirements of the other regulations and DOE orders. These opportunities are evaluated at all phases of decision making, remedial design, and remedial action. Three essential processes precede environmental restoration/remedial action at a DOE site/project: 1. Completion of decision-making documents required by governing or applicable statutes. 2. Completion of important scientific and engineering analyses of remedial alternatives, and design and implementation of the remedial solution established in the CERCLA Record of Decision (ROD). 3. Preparation of DOE-mandated documentation to record engineering evaluations and cost estimates required for budgeting, decision making, and project management. Methodology and requirements for each process have developed from long, successful practice, but independently of each other. FERMCO, as new DOE contractor at Fernald and first Environmental Restoration Management Contractor (ERMC), is committed to a process of Continuous Performance Improvement (CPI). A major reevaluation of documentation and processes for support of environmental decision-making and design of cleanup activities to remediate the five OUs at the FEMP is being undertaken.

2030 (FEMP-2318) Lessons learned during the D & D of Fernald Plant 7. Motl, G.P.; Borgman, T.D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 14 Jan 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940602-13: 35. annual meeting of the American Nuclear Society, New Orleans, LA (United States), 11-16 Jun 1994). Order Number DE94015807. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains information about lessons learned from the decontamination and decommissioning of the Feed Materials Production Center in Fernald Ohio. The

information relates to Plant 7 which was constructed to house processes for the reduction of uranium hexafluoride to uranium tetrafluoride. Topics discussed include: wash-down, lockdown, asbestos removal, and bidding for dismantlement projects.

2031 (FEMP-2320) Major issues associated with DOE commercial recycling initiatives. Motl, G.P. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Burns, D.D.; Rast, D.M. Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States). 27 Jul 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940578-11: Pollution prevention conference, Denver, CO (United States), 3-5 May 1994). Order Number DE94015808. Source: OSTI; NTIS; INIS; GPO Dep.

Major initiatives are underway within DOE to recycle large volumes of scrap material generated during cleanup of the DOE Weapons Complex. These recycling initiatives are driven not only by the desire to conserve natural resources, but also by the recognition that shallow level burial is not a politically acceptable option. The Fernald facility is in the vanguard of a number of major DOE recycling efforts. These early efforts have brought issues to light that can have a major impact on the ability of Fernald and other major DOE sites to expand recycling efforts in the future. Some of these issues are; secondary waste deposition, title to material and radioactive contaminants, mixed waste generated during recycling, special nuclear material possession limits, cost benefit, transportation of waste to processing facilities, release criteria, and uses for beneficially reused products.

2032 (FEMP-2324) Waste container fabrication from recycled DOE metal. Motl, G.P.; Burns, D.D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 15 Feb 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940225-117: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94015814. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has more than 2.5 million tons of radioactive scrap metal (RSM) that is either in inventory or expected to be generated over the next 25 years as major facilities within the weapons complex are decommissioned. Much of this material cannot be surface decontaminated. In an attempt to conserve natural resources and to avoid burial of this material at DOE disposal sites, options are now being explored to "beneficially reuse" this material in applications where small amounts of radioactivity are not a detriment. One example is where RSM is currently being beneficially used to fabricate shield blocks for use in DOE medium energy physics programs. This paper describes other initiatives now underway within DOE to utilize RSM to fabricate other products, such as radioactive waste shipping, storage and disposal containers.

2033 (FEMP-2326) Configuration management at an environmental restoration DOE facility (Fernald). Beckett, C. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Pasko, W.; Kupinski, T. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 2 Feb 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC05-92OR21972. (CONF-9405138-2-Vugraphs: 1994 Department of Energy configuration management workshop, Las Vegas, NV (United States), 3 May 1994). Order Number DE94016582. Source: OSTI; NTIS; INIS; GPO Dep.

Includes vugraphs.

This report contains information about a meeting held to discuss the decontamination and decommissioning of the Fernald site in Ohio. This site contains two major types of waste. First is the legacy waste. This waste consists of the wastes which were left over from production which is stored in various drums and containers across the site. Second is the waste generated from the remedial activities.

2034 (FEMP-2330) Decontamination and decommissioning of Plant 7 at the Fernald Facility. Motl, G.P.; Borgman, T. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 20 Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940406-14: International symposium on decontamination and decommissioning, Knoxville, TN (United States), 27-29 Apr 1994). Order Number DE94015813. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP), formerly the Feed Materials Production Center (FMPC), is a Department of Energy (DOE) site which produced high-quality uranium for military defense beginning in 1951. Production at the FEMP was halted in July 1989. Later that year, the facility was placed on the National Priorities List (NPL). The DOE is currently conducting a Remedial Investigation/Feasibility Study (RI/FS) and other response actions under the Amended Consent Agreement between the US Environmental Protection Agency (USEPA) and the DOE.

2035 (FEMP-2342) Site Environmental Report, 1993. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Jun 1994. 232p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. Order Number DE94018423. Source: OSTI; NTIS; INIS; GPO Dep.

The Site Environmental Report (SER) is prepared annually in accordance with DOE Order 5400.1, "General Environmental Protection Program." This 1993 SER provides the general public as well as scientists and engineers with the results from the site's ongoing Environmental Monitoring Program. Also included in this report is information concerning the site's progress toward achieving full compliance with requirements set forth by DOE, US Environmental Protection Agency (USEPA), and Ohio EPA (OEPA). For some readers, the highlights provided in the Executive Summary may provide sufficient information. Many readers, however, may wish to read more detailed descriptions of the information than those which are presented here.

2036 (FEMP-2354) Dose and risk assessment approach for the Fernald CERCLA D&D Project. Throckmorton, J.D. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Clark, T.R.; Waligora, S.J. Jr.; Haaker, R.F. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-941148-3: ANS meeting on environmental aspects of decommissioning, decontamination, and/or environmental

restoration at nuclear and mixed waste facilities, Washington, DC (United States), 13-17 Nov 1994). Order Number DE95003027. Source: OSTI; NTIS; INIS; GPO Dep.

At the Fernald Environmental Management Project (FEMP) the uranium processing facilities used from the 1952 through 1989 are near or beyond their intended design life. These current conditions present an increasing probability for future releases of hazardous substances to the environment. To support a decision by the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA) to remediate the buildings, a dose and risk assessment was performed to determine the extent of exposure that would be associated with the controlled decontamination and dismantlement (D&D) of the Fernald facilities. A conceptual risk assessment model was developed, with exposure mechanisms and associated pathways for each potential receptor. The three receptor groups were defined as: the remediation workers, other on-site workers (those not performing D&D), and off-site residents. For use in the conceptual model, an airborne source term was developed through process knowledge, other historical information and data, and air sample data from within the facilities. Individual and collective doses and risks were developed for each receptor and for each population group. The risk assessment demonstrated that all exposures resulting from the action would be within the acceptable DOE administrative control level of 2.0 rem per year for occupational workers and the acceptable EPA risk range from 10^{-6} to 10^{-4} for the general public.

2037 (FEMP/SUB-084) Proceedings of the waste recycling workshop. Bailey, R.E. (Ohio State Univ., Columbus, OH (United States)); Thomas, A.F.; Ries, M.A. (eds.). Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States); Ohio State Univ., Columbus, OH (United States). [1993]. 244p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-9310323-: Fernald environmental management project industrial workshop on waste recycling, Cincinnati, OH (United States), 5-6 Oct 1993). Order Number DE94012501. Source: OSTI; NTIS; GPO Dep.

Recorded are seventeen talks from five sessions at the workshop. FERMCO's recycling program, state of the art recycling technology, and an integrated demonstration of deactivation, decommissioning and decommissioning are presented in the plenary session. In the concrete session, decontamination and recycling are discussed. In the transit session, regulations are considered along with recycling and decontamination. In the metals session, radioactive scrap metals are emphasized. And in the regulatory considerations and liabilities session, DOE and EPA viewpoints are discussed. (GHH)

2038 (IAEA-TECDOC-755, pp. 63-77) Environmental modelling for the Hanford Environmental Dose Reconstruction Project. Napier, B.A. (Battelle Pacific Northwest Lab., Richland, WA (United States)); Shipler, D.B.; Farris, W.T.; Simpson, J.C.; Heeb, C.M.; Ramsdell, J.V. Jr.; Ikenberry, T.A.; Walters, W.H.; Freshley, M.D. International Atomic Energy Agency, Vienna (Austria). Jul 1994. In *Assessing the radiological impact of past nuclear activities and events. Part of the IAEA/CEC co-ordinated research programme on the validation of environmental model predictions (VAMP)*. 137p. Order Number DE95624202. Source: OSTI; NTIS (US Sales Only); INIS.

The Hanford Environmental Dose Reconstruction (HEDR) Project was established in 1987 to evaluate the release of

has been examined. The prototype cask should be tested to determine its overall variation in microstructure, chemistry, and mechanical properties. This prototype may also be subjected to 'proof testing' to demonstrate the validity of the design analysis (including the mechanical properties used in the analysis). The complete mechanical property mapping does not necessarily have to precede the proof testing (i.e., portions of the cask which experience only low (elastic) loads during the drop test are suitable for mechanical test specimens). The behavior of the prototype cask and the production casks are linked by assuring that each cask possesses at least the minimum level of one or more critical mechanical properties. This may be done by measuring the properties of interest directly, or by relying on a secondary measurement (such as subsize mechanical test results or microstructure/compositional measurements) which has been statistically correlated to the critical properties. The database required to show the correlation between the secondary measurement and the valid design property may be established by tests on the material from the prototype cask. The production controls must be demonstrated as being adequate to assure that a uniform product is produced. The testing of coring (or test block or prolongation) samples can only be viewed as providing a valid link to the benchmark results provided by the prototype cask if the process used to create follow-on casks remains essentially similar. The MO-SAIK Test Program has demonstrated the qualification method through the benchmarking stage. The program did not establish for qualifying serial production casks through, for example, a correlation between small specimen parameters and valid design fracture toughness properties. Such a correlation would require additional experimental work. (J.P.N.).

2048 (INIS-JP-018, pp. 1403-1410) **Development and evaluation of measurement devices used to support testing of radioactive material transportation packages.** Uncapher, W.L. (Sandia National Laboratories, Albuquerque, NM (United States)); Ammerman, D.J.; Stenberg, D.R.; Bronowski, D.R.; Arviso, M. 1993. 1709p. (CONF-920905-; PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings*. Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Measurement devices have been developed to support specific testing applications associated with radioactive material packages. These measurement devices include evaluation channels, ruggedly constructed LVDTs, and piezoresistive accelerometers. In addition, a method was developed to evaluate accelerometers and strain gages in both laboratory and field environments. The results of this evaluation showed no major difference in the measurements obtained by transducers manufactured by different companies. Table 1 gives a summary of the results from the accelerometer and strain gage evaluations. These results showed that the data were not, in general, more accurate than $\pm 10\%$ of the measured result. It is very likely that the majority of these deviations are due to changes in the quantities being measured, rather than transducer response. This is because the transducer only measures the response at the mounting location, which may not be the same as the response at a nearby location. (J.P.N.).

2049 (LA-12857-ENV) **Environmental analysis of Lower Pueblo/Lower Los Alamos Canyon, Los Alamos, New Mexico.** Ferenbaugh, R.W.; Buhl, T.E.; Stoker, A.K.; Becker, N.M.; Rodgers, J.C.; Hansen, W.R. Los Alamos National Lab., NM (United States). Dec 1994. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005744. Source: OSTI; NTIS; INIS; GPO Dep.

The radiological survey of the former radioactive waste treatment plant site (TA-45), Acid Canyon, Pueblo Canyon, and Los Alamos Canyon found residual contamination at the site itself and in the channel and banks of Acid, Pueblo, and lower Los Alamos Canyons all the way to the Rio Grande. The largest reservoir of residual radioactivity is in lower Pueblo Canyon, which is on DOE property. However, residual radioactivity does not exceed proposed cleanup criteria in either lower Pueblo or lower Los Alamos Canyons. The three alternatives proposed are (1) to take no action, (2) to construct a sediment trap in lower Pueblo Canyon to prevent further transport of residual radioactivity onto San Ildefonso Indian Pueblo land, and (3) to clean the residual radioactivity from the canyon system. Alternative 2, to cleanup the canyon system, is rejected as a viable alternative. Thousands of truckloads of sediment would have to be removed and disposed of, and this effort is unwarranted by the low levels of contamination present. Residual radioactivity levels, under either present conditions or projected future conditions, will not result in significant radiation doses to persons exposed. Modeling efforts show that future transport activity will not result in any residual radioactivity concentrations higher than those already existing. Thus, although construction of a sediment trap in lower Pueblo Canyon is a viable alternative, this effort also is unwarranted, and the no-action alternative is the preferred alternative.

2050 (LA-UR-94-3724) **Lessons learned from commercial experience with nuclear plant decontamination to safe storage.** Fischer, S.R.; Partain, W.L.; Sype, T. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-36: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95003719. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has successfully performed decontamination and decommissioning (D&D) on many production reactors. DOE now has the challenge of performing D&D on a wide variety of other nuclear facilities. Because so many facilities are being closed, it is necessary to place many of them into a safe-storage status before conducting D&D for perhaps as much as 20 yr. The challenge is to achieve this safe-storage condition in a cost-effective manner while remaining in compliance with applicable regulations. The DOE Office of Environmental Management, Office of Transition and Management, commissioned a lessons learned study of commercial experience with safe storage and transition to D&D. Although the majority of the commercial experience has been with reactors, many of the lessons learned presented in this paper are directly applicable to transitioning the DOE Weapons Complex.

2051 (LA-UR-95-376) **Partnering with Pueblos: Involving American Indians in environmental restoration activities at Los Alamos National Laboratory, New Mexico.** Shaner, M.H.; Naranjo, L. Jr. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-41: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006282. Source: OSTI; NTIS; INIS; GPO Dep.

Many communities in the area surrounding Los Alamos are very concerned about the environmental impact past and current Laboratory operations have on their communities. Their main concerns are contamination of water, soil and air as well as the hazardous and radioactive wastes stored at the Laboratory site. Environmental surveillance results show that contamination may have migrated off-site through the canyons of the Pajarito Plateau to the Rio Grande. San Ildefonso Pueblo and Cochiti Pueblo are located downstream from the canyons that drain the Los Alamos town site and Laboratory lands. Several other pueblos are also located downstream from the Laboratory. The Pueblos located upstream from the laboratory indicated that contamination of air and worry about the contamination of the animals they hunt for food is a more important concern to them. There are many canyons that drain the areas where Los Alamos and Laboratory property are located. To be able to characterize those canyons that are known or suspected to have received contamination, the ER Project needs to prepare RCRA Facility Investigation (RFI) work plans for approval by the Environmental Protection Agency (EPA). Once EPA approves the work plan, characterization activities can start for the specific areas identified in the work plan.

2052 (LA-UR-95-381) Plan for increasing public participation in cleanup decisions for the Los Alamos National Laboratory. Los Alamos National Lab., NM (United States). Jan 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006289. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a plan for involving the public in decisions related to cleaning up sites suspected of being contaminated with chemicals or radioactivity at Los Alamos National Laboratory. In this section we describe the purpose of the Environmental Remediation Project, our past efforts to communicate with the northern New Mexico community, and the events that brought about our realization that less traditional, more innovative approaches to public involvement are needed.

2053 (ORNL-6844) Level 3 baseline risk evaluation for Building 3506 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Golden, K.M.; Robers, S.K.; Cretella, F.M. Oak Ridge National Lab., TN (United States). Dec 1994. 356p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008965. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Level 3 Baseline Risk Evaluation (BRE) performed on Building 3506 located at the Oak Ridge National Laboratory (ORNL). This BRE is intended to provide an analysis of the potential for adverse health effects (current or future) posed by contaminants at the facility. The decision was made to conduct a Level 3 (least rigorous) BRE because only residual contamination exists in the building. Future plans for the facility (demolition) also preclude a rigorous analysis. Site characterization activities for Building 3506 were conducted in fall of 1993. Concrete core samples were taken from the floors and walls of both the cell and the east gallery. These cores were analyzed for radionuclides and organic and inorganic chemicals. Smear samples and direct radiation measurements were also collected. Sediment exists on the floor of the cell and

was also analyzed. To adequately characterize the risks posed by the facility, receptors for both current and potential future land uses were evaluated. For the current land use conditions, two receptors were evaluated. The first receptor is a hypothetical maintenance worker who spends 250 days (8 hours/day) for 25 years working in the facility. The remaining receptor evaluated is a hypothetical S and M worker who spends 2 days (8 hours/day) per year for 25 years working within the facility. This particular receptor best exemplifies the current worker scenario for the facility. The two current exposure scenarios and parameters of exposure (e.g., inhalation and ingestion rates) have been developed to provide a conservative (i.e. health protective) estimate of potential exposure.

2054 (ORNL-6846) Level III baseline risk evaluation for Building 3505 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Mostella, W.B. Jr. Oak Ridge National Lab., TN (United States). Dec 1994. 256p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004996. Source: OSTI; NTIS; INIS; GPO Dep.

The Level III Baseline Risk Evaluation (BRE) for Building 3505, the ORNL Metal Recovery Facility, provides an analysis of the potential for adverse health effects, current or future, associated with the presence of hazardous substances in the building. The Metal Recovery Facility was used from 1952 through 1960 to process large quantities of radioactive material using the PUREX process for the recovery of uranium-238, plutonium-239, neptunium-237, and americium-241. The facility consists of seven process cells (A through G), a canal, a dissolver room, a dissolver pit, an office, locker room, storage area, control room, electrical gallery, shop, and makeup area. The cells were used to house the nuclear fuel reprocessing equipment, and the canal was constructed to be used as a water-shielded transfer canal. Currently, there are no known releases of radioactive contaminants from Building 3505. To perform the BRE, historical radiological survey data were used to estimate the concentration of alpha- and beta/gamma emitting radionuclides in the various cells, rooms, and other areas in Building 3505. Data from smear surveys were used to estimate the amount of transferable contamination (to which receptors can be exposed via inhalation and ingestion), and data from probe surveys were used to estimate the amount of both fixed and transferable contamination (from which receptors can receive external exposure). Two land use scenarios, current and future, and their subsequent exposure scenarios were explored in the BRE. Under the current land use scenario, two exposure scenarios were evaluated. The first was a worst-case industrial exposure scenario in which the receptor is a maintenance worker who works 8 hours/day, 350 days/year in the building for 25 years. In the second, more realistic exposure scenario, the receptor is a surveillance and maintenance (S&M) worker who spends two 8-hour days/year in the building for 25 years.

2055 (ORNL/ER-167) Program Management Plan for the Martin Marietta Energy Systems, Inc., Oak Ridge National Laboratory Site Environmental Restoration Program. Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Knoxville, TN (United States). Jul 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019209. Source: OSTI; NTIS; INIS; GPO Dep.

This program management plan describes the scope, objectives, and method of accomplishment for the Martin

Marietta Energy Systems, Inc. (Energy Systems) Oak Ridge National Laboratory (ORNL) Environmental Restoration (ER) Program. The ORNL ER Program is one of five site programs, receiving guidance from and reporting to the Energy Systems ER Division. Therefore, all ORNL ER policies and procedures are consistent with ER Division policies and procedures. This plan covers all ORNL ER activities, the participants involved in these activities (and their roles and responsibilities), and all phases of the remediation process. This plan will also serve as a template that may be supplemented as necessary to produce individual project management plans for specific projects. This document explains how the Energy Systems ORNL ER Program does business, so the ORNL ER Program's management structure is illustrated in detail. Personnel are matrixed to the ER Program from other organizations to assist with specific projects. This plan identifies positions at the program level and discusses responsibilities and interactions with positions at the project level. This plan includes sections that describe requirements for project plans, work breakdown structures, schedules, project management and cost control systems, and information and reporting. Project management plans will utilize the work breakdown structure and dictionary pages in the appropriate life cycle baseline report. This plan describes the information that should be contained in ORNL ER project management plans. The most important milestones are primary documents relating to the management and remediation of contaminated sites. Primary document milestones are subject to stipulated penalties and receive paramount attention.

2056 (ORNL/ER-216) Alternatives evaluation for the decontamination and decommissioning of buildings 3506 and 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program. Ebasco Services, Inc., Oak Ridge, TN (United States); Oak Ridge National Lab., TN (United States). Jan 1994. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-91OR21928. Order Number DE94008555. Source: OSTI; NTIS; INIS; GPO Dep.

This is an alternative evaluation document that records the evaluation process and justification for choosing the alternative recommended for the decontamination and decommissioning (D&D) of the 3506 and 3515 buildings at the Oak Ridge National Laboratory (ORNL). The alternatives for the D&D of the two buildings were: (1) no action (continued surveillance and maintenance), (2) decontamination for free release, (3) entombment in place, (4) partial dismantlement, and (5) complete dismantlement. Soil remediation is not included in any of the alternatives. The recommended alternative for the D&D of Building 3506 is partial dismantlement at an estimated cost of \$936,000 in escalated dollars. The cost estimate for complete dismantlement is \$1,384,000. The recommended alternative for the D&D of Building 3515 is complete dismantlement at an estimated cost of \$3,733,000 in escalated dollars. This alternative is recommended, because the soils below the foundation of the 3515 building are highly contaminated, and removing the foundation in the D&D project results in lower overall worker risk, costs, and improved post-D&D site conditions. A further recommendation is to revise these cost estimates after the conclusion of the ongoing characterization study. The results of the characterization of the two buildings is expected to change some of the assumptions and resolve some of the uncertainties in the development of these estimates.

2057 (ORNL/ER-226) Health and safety plan for the Environmental Restoration Program at Oak Ridge National Laboratory. Clark, C. Jr.; Burman, S.N.; Cipriano, D.J. Jr.; Uziel, M.S.; Kleinhans, K.R.; Tiner, P.F. Oak Ridge National Lab., TN (United States). Aug 1994. 304p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003988. Source: OSTI; NTIS; INIS; GPO Dep.

This Programmatic Health and Safety plan (PHASP) is prepared for the U.S. Department of Energy (DOE) Oak Ridge National Laboratory (ORNL) Environmental Restoration (ER) Program. This plan follows the format recommended by the U.S. Environmental Protection Agency (EPA) for remedial investigations and feasibility studies and that recommended by the EM40 Health and Safety Plan (HASP) Guidelines (DOE February 1994). This plan complies with the Occupational Safety and Health Administration (OSHA) requirements found in 29 CFR 1910.120 and EM-40 guidelines for any activities dealing with hazardous waste operations and emergency response efforts and with OSHA requirements found in 29 CFR 1926.65. The policies and procedures in this plan apply to all Environmental Restoration sites and activities including employees of Energy Systems, subcontractors, and prime contractors performing work for the DOE ORNL ER Program. The provisions of this plan are to be carried out whenever activities are initiated that could be a threat to human health or the environment. This plan implements a policy and establishes criteria for the development of procedures for day-to-day operations to prevent or minimize any adverse impact to the environment and personnel safety and health and to meet standards that define acceptable management of hazardous and radioactive materials and wastes. The plan is written to utilize past experience and best management practices to minimize hazards to human health and safety and to the environment from event such as fires, explosions, falls, mechanical hazards, or any unplanned release of hazardous or radioactive materials to air, soil, or surface water.

2058 (ORNL/ER-235) Waste management plan for the remedial investigation of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Baron, L.A. Oak Ridge National Lab., TN (United States). Oct 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002308. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Waste Management Plan defines the criteria and methods to be used for managing waste generated during activities associated with Waste Area Grouping 2 at Oak Ridge National Laboratory. The waste management strategy is based on the generation and management of waste on a systematic basis using the most appropriate combination of waste reduction, segregation, treatment, storage, and disposal practices while protecting the environment and human health, maintaining as low as reasonably achievable limits. This plan contains provisions for safely and effectively managing soils and sediments, sampling water, decontamination fluids, and disposable personal protective equipment consistent with the US Environmental Protection Agency guidance. This plan will be used in conjunction with the ORNL ER Program Waste Management Plan.

2059 (ORNL/ER-239) Alternatives evaluation and decommissioning study on shielded transfer tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee. DeVore, J.R.; Hinton, R.R. Oak Ridge National Lab., TN

(United States). Engineering Div. Aug 1994. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94018409. Source: OSTI; NTIS; INIS; GPO Dep.

The shielded transfer tanks (STTs) are five obsolete cylindrical shipping casks which were used to transport high specific activity radioactive solutions by rail during the 1960s and early 1970s. The STTs are currently stored at the Oak Ridge National Laboratory under a shed roof. This report is an evaluation to determine the preferred alternative for the final disposition of the five STTs. The decommissioning alternatives assessed include: (1) the no action alternative to leave the STTs in their present location with continued surveillance and maintenance; (2) solidification of contents within the tanks and holding the STTs in long term retrievable storage; (3) sale of one or more of the used STTs to private industry for use at their treatment facility with the remaining STTs processed as in Alternative 4; and (4) removal of tank contents for de-watering/retrievable storage, limited decontamination to meet acceptance criteria, smelting the STTs to recycle the metal through the DOE contaminated scrap metal program, and returning the shielding lead to the ORNL lead recovery program because the smelting contractor cannot reprocess the lead. To completely evaluate the alternatives for the disposition of the STTs, the contents of the tanks must be characterized. Shielding and handling requirements, risk considerations, and waste acceptance criteria all require that the radioactive inventory and free liquids residual in the STTs be known. Because characterization of the STT contents in the field was not input into a computer model to predict the probable inventory and amount of free liquid. The four alternatives considered were subjected to a numerical scoring procedure. Alternative 4, smelting the STTs to recycle the metal after removal/de-watering of the tank contents, had the highest score and is, therefore, recommended as the preferred alternative. However, if a buyer for one or more STT could be found, it is recommended that Alternative 3 be reconsidered.

2060 (ORNL/ER-241) HAZWOPER work plan and site safety and health plan for the Alpha characterization project at the solid waste storage area 4 bathtubbing trench at Oak Ridge National Laboratory. Oak Ridge National Lab., TN (United States). Jul 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94018397. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan/site safety and health plan is for the alpha sampling project at the Solid Waste Storage Area 4 bathtubbing trench. The work will be conducted by the Oak Ridge National Laboratory (ORNL) Environmental Sciences Division and associated ORNL environmental, safety, and health support groups. This activity will fall under the scope of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). The purpose of this document is to establish health and safety guidelines to be followed by all personnel involved in conducting work for this project. Work will be conducted in accordance with requirements as stipulated in the ORNL HAZWOPER Program Manual and applicable ORNL; Martin Marietta Energy Systems, Inc.; and U.S. Department of Energy policies and procedures. The levels of protection and the procedures specified in this plan are based on the best information available from historical data and preliminary evaluations of the area. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site

conditions or changes in scope of work may warrant a reassessment of the stated protection levels and controls. All adjustments to the plan must have prior approval by the safety and health disciplines signing the original plan.

2061 (ORNL/ER-280) Annual summary report of the Decontamination and Decommissioning Surveillance and Maintenance Program at Oak Ridge National Laboratory for period ending September 30, 1994. Anderson, L.A. (comp.); Burwinkle, T.W.; Ford, M.K.; Gaddis, H.R.; Holder, L. Jr.; Mandry, G.J.; Nelson, T.R.; Patton, B.D. Oak Ridge National Lab., TN (United States). Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009999. Source: OSTI; NTIS; INIS; GPO Dep.

The Surplus Facilities Management Program (SFMP) was established at Oak Ridge National Laboratory (ORNL) in 1976 to provide collective management of all surplus sites under ORNL's control on the Oak Ridge Reservation. Presently, over 50 facilities, grouped into projects, are currently managed by the Decontamination and Decommissioning Program, the successor program to the SFMP. Support includes (1) surveillance and maintenance planning; (2) routine surveillance and maintenance; and (3) special maintenance projects. This report documents routine surveillance and maintenance, special projects, and special maintenance performed on these facilities for the period of October 1993 through September 1994.

2062 (ORNL/ER-282) FY 1994 annual summary report of the surveillance and maintenance activities for the Oak Ridge National Laboratory Environmental Restoration Program. Oak Ridge National Lab., TN (United States); Stoller (S.M.) Corp., Oak Ridge, TN (United States). Nov 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003970. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory (ORNL) Environmental Restoration (ER) Surveillance and Maintenance (S and M) Program was initiated to manage former waste management and environmental research sites contaminated with radioactive materials and/or hazardous chemicals. The S and M Program is responsible for managing designated sites/facilities from the end of their operating lives until final disposition or site stabilization. To effectively manage and perform the various S and M Program responsibilities, five summary-level work breakdown structure (WBS) elements have been established: S and M Preliminary Investigations, Special Projects, Routine S and M, Inactive Groundwater Wells, and Project Management. Routine S and M activities were conducted as scheduled throughout fiscal years (FY) 1994 at applicable inactive waste management (WM) and other contaminated areas. Overall, the ER S and M Program maintains 47 facilities, performs vegetation maintenance on approximately 230 acres, maintains 54 inactive tanks, and provides overall site management on over 700 acres. In addition to the routine S and M activities, detailed site inspections were conducted at established frequencies on appropriate sites in the ER S and M Program. This document provides a summary of the FY 1994 ORNL ER S and M Program accomplishments.

2063 (ORNL/ER-288) Waste management/waste certification plan for the Oak Ridge National Laboratory Environmental Restoration Program. Clark, C. Jr.; Hunt-Davenport, L.D.; Cofer, G.H. Oak Ridge National Lab., TN (United States). Mar 1995. 159p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010052. Source: OSTI; NTIS; INIS; GPO Dep.

This Waste Management/Waste Certification (C) Plan, written for the Environmental Restoration (ER) Program at Oak Ridge National Laboratory (ORNL), outlines the criteria and methodologies to be used in the management of waste generated during ORNL ER field activities. Other agreed upon methods may be used in the management of waste with consultation with ER and Waste Management Organization. The intent of this plan is to provide information for the minimization, handling, and disposal of waste generated by ER activities. This plan contains provisions for the safe and effective management of waste consistent with the U.S. Environmental Protection Agency's (EPA's) guidance. Components of this plan have been designed to protect the environment and the health and safety of workers and the public. It, therefore, stresses that investigation derived waste (IDW) and other waste be managed to ensure that (1) all efforts be made to minimize the amount of waste generated; (2) costs associated with sampling storage, analysis, transportation, and disposal are minimized; (3) the potential for public and worker exposure is not increased; and (4) additional contaminated areas are not created.

2064 (ORNL/ER/Sub-87-99053/72) **Site characterization report for Building 3506 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program.** Bechtel National, Inc., Oak Ridge, TN (United States); Oak Ridge National Lab., TN (United States). Jul 1994. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94018405. Source: OSTI; NTIS; INIS; GPO Dep.

Building 3506, also known as the Waste Evaporator Facility, is a surplus facility at Oak Ridge National Laboratory (ORNL) slated for decontamination and decommissioning (D&D). The building is located in the ORNL main plant area, to the west of the South Tank Farm and near the intersection of Central Avenue and Third Street. Characterization tasks consisted of three main activities: inspections, radiological measurements, and radiological and chemical sampling and analysis. Inspection reports document general facility conditions, as-built information, and specialized information such as structural evaluations. Radiological measurements define the quantity and distribution of radioactive contaminants; this information is used to calibrate a dose model of the facility and estimate the total activity, in curies, of each major radioactive isotope. The radiological information from sample analyses is used to refine the radiological model of the facility, and the radionuclide and hazardous chemical analyses are used for waste management planning. This report presents data from the field investigation and laboratory analyses in the form of a site description, as-built drawings, summary tables of radiological and chemical contaminant concentrations, and a waste volume estimate.

2065 (ORNL/ER/Sub-87-99053/73) **Site characterization report for Building 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Aug 1994. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019249. Source: OSTI; NTIS; INIS; GPO Dep.

Engineering drawings for this project are identified as CAPE-3085. Inquiries may be directed to: Office of Scientific

and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

Building 3515 at Oak Ridge National Laboratory (ORNL), also known as the Fission Product Pilot Plant, is a surplus facility in the main plant area to the east of the South Tank Farm slated for decontamination and decommissioning (D&D). The building consists of two concrete cells (north and south) on a concrete pad and was used to extract radioisotopes of ruthenium, strontium, cesium, cerium, rhodium and other elements from aqueous fission product waste. Site characterization activities of the building were initiated. The objective of the site characterization was to provide information necessary for engineering evaluation and planning of D&D approaches, planning for personal protection of D&D workers, and estimating waste volumes from D&D activities. This site characterization report documents the investigation with a site description, a summary of characterization methods, chemical and radiological sample analysis results, field measurement results, and waste volume estimates.

2066 (ORNL/TM-12390) **Results of the independent radiological verification survey at the former Bridgeport Brass Company Facility, Seymour, Connecticut (SSC001).** Foley, R.D.; Rice, D.E.; Allred, J.F.; Brown, K.S. Oak Ridge National Lab., TN (United States). Mar 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010688. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the USDOE, a team from ORNL conducted an independent radiological verification survey at the former Bridgeport Brass Company Facility, Seymour, Connecticut, from September 1992 to March 1993. Purpose of the survey was to determine whether residual levels of radioactivity inside the Ruffert Building and selected adjacent areas were remediated to levels below DOE guidelines for FUSRAP sites. The property was contaminated with radioactive residues of ^{238}U from uranium processing experiments conducted by Reactive Metals, Inc., from 1962 to 1964 for the Atomic Energy Commission. A previous radiological survey did not characterize the entire floor space because equipment which could not be moved at the time made it inaccessible for radiological surveys. During the remediation process, additional areas of elevated radioactivity were discovered under stationary equipment, which required additional remediation and further verification. Results of the independent radiological verification survey confirm that, with the exception of the drain system inside the building, residual uranium contamination has been remediated to levels below DOE guidelines for unrestricted release of property at FUSRAP sites inside and outside the Ruffert Building. However, certain sections of the drain system retain uranium contamination above DOE surface guideline levels. These sections of pipe are addressed in separate, referenced documentation.

2067 (ORNL/TM-12817, pp. 153-161) **Site-specific calibration of the Hanford personnel neutron dosimeter.** Endres, A.W. (Pacific Northwest Lab., Richland, WA (United States)); Brackenbush, L.W.; Baumgartner, W.V.; Rathbone, B.A. Oak Ridge National Lab., TN (United States). Oct 1994. DOE Contract AC06-76RL01830. (CONF-9410171-43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A new personnel dosimetry system, employing a standard Hanford thermo-luminescent dosimeter (TLD) and a combination dosimeter with both CR-39 nuclear track and TLD-albedo elements, is being implemented at Hanford. Measurements were made in workplace environments in order to verify the accuracy of the system and establish site-specific factors to account for the differences in dosimeter response between the workplace and calibration laboratory. Neutron measurements were performed using sources at Hanford's Plutonium Finishing Plant under high-specific neutron spectra. The dosimeter was also calibrated using bare and moderated ^{252}Cf sources under low-scatter conditions available in the Hanford Calibration Laboratory. Dose equivalent rates in the workplace were calculated from spectrometer measurements using tissue equivalent proportional counter (TEPC) and multisphere spectrometers. The accuracy of the spectrometers counter (TEPC) and multisphere spectrometers. The accuracy of the spectrometers was verified by measurements on neutron sources with calibrations directly traceable to the National Institute of Standards and Technology (NIST).

2068 (ORNL/TM-12817, pp. 369) **External exposure to arbitrary distributions of radionuclides in soil.** Ryman, J.C. (Oak Ridge National Lab., TN (United States)); Eckerman, K.F. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A program has been developed for MS-Dos personal computers which can generate dose coefficients for arbitrary distributions of radionuclides as a function of depth below the air-ground interface, using superposition of the dose coefficients for the monoenergetic planar sources. Coefficients can be computed for any of the 825 radionuclides having decay data in Publication 398 of the ICRP. Uniform and exponentially-distributed analytical source distributions are also available between any two depth boundaries. Coefficients are available both in SI and traditional units for individual organ, for effective dose equivalent as formulated in ICRP Publication 26, and for effective dose as formulated in ICRP Publication 60.

2069 (ORNL/TM-12817, pp. 371-380) **Evaluation of new and conventional thermoluminescent phosphors for environmental monitoring using automated thermoluminescent dosimeter readers.** Rathbone, B.A. (Pacific Northwest Lab., Richland, WA (United States)); Endres, A.W.; Antonio, E.J. Oak Ridge National Lab., TN (United States). Oct 1994. DOE Contract AC06-76RL01830. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In recent years there has been considerable interest in a new generation of super-sensitive thermoluminescent (TL) phosphors for potential use in routine personnel and environmental monitoring. Two of these phosphors are evaluated in this paper for selected characteristics relevant to environmental monitoring, along with two conventional phosphors widely used in environmental monitoring. The characteristics evaluated are light-induced fading, light-induced background, linearity and variability at low dose, and the minimum measurable dose. These characteristics

were determined using an automated commercial dosimetry system and routine processing protocols. Annealing and readout protocols for each phosphor were optimized for use in a large-scale environmental monitoring program.

2070 (ORNL/TM-12900) **Contaminated nickel scrap processing.** Compere, A.L.; Griffith, W.L.; Hayden, H.W.; Johnson, J.S. Jr.; Wilson, D.F. Oak Ridge National Lab., TN (United States). Dec 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009063. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE will soon choose between treating contaminated nickel scrap as a legacy waste and developing high-volume nickel decontamination processes. In addition to reducing the volume of legacy wastes, a decontamination process could make 200,000 tons of this strategic metal available for domestic use. Contaminants in DOE nickel scrap include ^{234}Th , ^{234}Pa , ^{137}Cs , ^{239}Pu (trace), ^{60}Co , U, ^{99}Tc , and ^{237}Np (trace). This report reviews several industrial-scale processes - electrorefining, electrowinning, vapormetallurgy, and leaching - used for the purification of nickel. Conventional nickel electrolysis processes are particularly attractive because they use side-stream purification of process solutions to improve the purity of nickel metal. Additionally, nickel purification by electrolysis is effective in a variety of electrolyte systems, including sulfate, chloride, and nitrate. Conventional electrorefining processes typically use a mixed electrolyte which includes sulfate, chloride, and borate. The use of an electrorefining or electrowinning system for scrap nickel recovery could be combined effectively with a variety of processes, including cementation, solvent extraction, ion exchange, complex-formation, and surface sorption, developed for uranium and transuranic purification. Selected processes were reviewed and evaluated for use in nickel side-stream purification. 80 refs.

2071 (ORNL/TM-12906) **Baseline requirements of the proposed action for the Transportation Management Division routing models.** Johnson, P.E.; Joy, D.S. Oak Ridge National Lab., TN (United States). Feb 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008657. Source: OSTI; NTIS; INIS; GPO Dep.

The potential impacts associated with the transportation of hazardous materials are important to shippers, carriers, and the general public. This is particularly true for shipments of radioactive material. The shippers are primarily concerned with safety, security, efficiency, and equipment requirements. The carriers are concerned with the potential impact that radioactive shipments may have on their operations - particularly if such materials are involved in an accident. The general public has also expressed concerns regarding the safety of transporting radioactive and other hazardous materials through their communities. Because transportation routes are a central concern in hazardous material transport, the prediction of likely routes is the first step toward resolution of these issues. In response to these routing needs, several models have been developed over the past fifteen years at Oak Ridge National Laboratory (ORNL). The HIGHWAY routing model is used to predict routes for truck transportation, the INTERLINE routing model is used to predict both rail and barge routes, and the AIRPORT locator model is used to determine airports with specified criteria near a specific location. As part of the ongoing improvement of the US Department of Energy's (DOE) Environmental

Management Transportation Management Division's (EM-261) computer systems and development efforts, a Baseline Requirements Assessment Session on the HIGHWAY, INTERLINE, and AIRPORT models was held at ORNL on April 27, 1994. The purpose of this meeting was to discuss the existing capabilities of the models and data bases and to review enhancements of the models and data bases to expand their usefulness. The results of the Baseline Requirements Assessment Session will be discussed in this report. The discussions pertaining to the different models are contained in separate sections.

2072 (PNL-9785) Data Compendium for the Columbia River comprehensive impact assessment. Esslinger, P.W.; Huesties, L.R.; Maughan, A.D.; Miley, T.B.; Walters, W.H. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007264. Source: OSTI; NTIS; INIS; GPO Dep. Report includes 2 diskettes designed to run on IBM PC or compatible equipment.

The Columbia River Comprehensive Impact Assessment (CRCIA). The CRCIA is conducted by the Pacific Northwest Laboratory (PNL). The purpose of the CRCIA is to evaluate the current human and ecological risk from the Columbia River attributable to past and present activities on the Hanford Site. Human risk will be addressed for radioactive and hazardous materials over a range of river use options. Ecological risk will be evaluated relative to the health of the current river ecosystem. The initial effort for the CRCIA is the development of a compendium of existing data on Columbia River contamination. This document provides the data compendium. It also includes a discussion of data sources, descriptions of the physical format of the data, and descriptions of the search process used to identify data.

2073 (PNL-10133) Descriptions of representative contaminated sites and facilities within the DOE complex. Short, S.M. (Pacific Northwest Lab., Richland, WA (United States)); Buck, J.W.; Clark, L.L.; Fletcher, J.F.; Glantz, C.S.; Holdren, G.R.; Huesties, L.R.; Williams, M.D.; Oates, L. Battelle Pacific Northwest Lab., Richland, WA (United States); Oak Ridge National Lab., TN (United States). Oct 1994. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830; AC05-84OR21400. Order Number DE95001854. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has initiated efforts to prepare a Programmatic Environmental Impact Statement (PEIS) that will analyze the existing environmental restoration and waste management program and evaluate alternatives for an integrated program. The alternatives being evaluated include (1) a "No Action" alternative as required by the National Environmental Policy Act (NEPA), (2) an Applicable, Relevant, and Appropriate Requirements (ARAR)-driven alternative, (3) a land-use-driven alternative, (4) a health-risk-driven alternative, and (5) a combination land-use and health-risk-driven alternative. The analytical approach being taken to evaluate each of these alternatives is to perform a remedial engineering analysis and human health and ecosystem effects analyses on every contaminated site and facility in the DOE complex. One of Pacific Northwest Laboratory's (PNL) roles in this approach has been to compile the source term and environmental setting data needed to drive each of these analyses. To date, over 10,000 individual contaminated sites and facilities located

throughout the DOE complex of installations have been identified and at least some minimal data compiled on each. The PEIS analyses have been appreciably simplified by categorizing all of these contaminated sites and facilities into six broad categories: (1) contaminated buildings, (2) contaminated soils, (3) solid waste sites (e.g., burial grounds), (4) liquid containment structures (e.g., tanks), (5) surface water sites, and (6) contaminated groundwater sites. A report containing a complete description of each of these thousands of contaminated sites and facilities would be tremendously large and unwieldy, as would separate reports describing the application of the analytical methodologies to each.

2074 (PNL-10249) Transportation Impact analysis for shipment of irradiated N-reactor fuel and associated materials. Daling, P.M.; Harris, M.S. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005438. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis of the radiological and nonradiological impacts of highway transportation of N-Reactor irradiated fuel (N-fuel) and associated materials is described in this report. N-fuel is proposed to be transported from its present locations in the 105-KE and 105-KW Basins, and possibly the PUREX Facility, to the 327 Building for characterization and testing. Each of these facilities is located on the Hanford Site, which is near Richland, Washington. The projected annual shipping quantity is 500 kgU/yr for 5 years for a total of 2500 kgU. It was assumed the irradiated fuel would be returned to the K- Basins following characterization, so the total amount of fuel shipped was assumed to be 5000 kgU. The shipping campaign may also include the transport and characterization of liquids, gases, and sludges from the storage basins, including fuel assembly and/or canister parts that may also be present in the basins. The impacts of transporting these other materials are bounded by the impacts of transporting 5000 kgU of N-fuel. This report was prepared to support an environmental assessment of the N-fuel characterization program. The RADTRAN 4 and GENII computer codes were used to evaluate the radiological impacts of the proposed shipping campaign. RADTRAN 4 was used to calculate the routine exposures and accident risks to workers and the general public from the N-fuel shipments. The GENII computer code was used to calculate the consequences of the maximum credible accident. The results indicate that the transportation of N-fuel in support of the characterization program should not cause excess radiological-induced latent cancer fatalities or traffic-related nonradiological accident fatalities. The consequences of the maximum credible accident are projected to be small and result in no excess latent cancer fatalities.

2075 (PNL-10260) Financial assistance to States and tribes to support emergency preparedness and response and the safe transportation of hazardous shipments. Bradbury, J.A.; Jones, M.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006239. Source: OSTI; NTIS; INIS; GPO Dep.

This report identifies and summarizes existing sources of financial assistance to States and Indian tribes in preparing and responding to transportation emergencies and ensuring the safe transportation of hazardous shipments through their jurisdictions. The report has been prepared as an information resource for the US Department of Energy's Office of

Environmental Restoration and Waste Management, Office of Transportation, Emergency Management and Analytical Services. The report discusses funding programs administered by the following Federal agencies: Federal Emergency Management Agency; Department of Transportation; the Environmental Protection Agency; and the Department of Energy. Also included is a summary of fees assessed by some States on carriers of hazardous materials and hazardous waste. The discussion of programs is supplemented by an Appendix that provides a series of tables summarizing funding sources and amounts. The report includes several conclusions concerning the level of funding provided to Indian tribes, the relative ranking of funding sources and the variation among States in overall revenues for emergency response and safe transportation.

2076 (PNL-10415) Stakeholder involvement report for the Cryocell® demonstration at Hanford. Vick, J.D. (Pacific Northwest Lab., Richland, WA (United States)); Peterson, T.S.; McCabe, G.H.; Niesen, K.A.; Serie, P.J. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006370. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is evaluating frozen soil subsurface barriers as a way, to contain the spread of contamination. CRACKLE is one such technology being evaluated in terms of technical performance, operating requirements, and cost of deployment in and soils. The primary source of data for this evaluation will be a full-scale field demonstration to be conducted at an uncontaminated site at the Hanford Reservation during fiscal years 1994-1996. Experience has shown that not addressing stakeholder concerns early on in the process of technology development can lead to expending resources on remedial approaches that are ultimately not deployable. Therefore the CRACKLE project worked with stakeholders to help ensure that stakeholder issues and concerns, that if left unacknowledged could delay or block the deployment of the technology, were addressed during the technology's demonstration. The insights gained from stakeholder involvement in the CRACKLE demonstration project apply to other remediation technologies. Section IV and Appendix A of this report provide additional information about stakeholder comments. Understanding these insights will allow remedial project managers to anticipate issues of concern to stakeholders, to involve them effectively and to speed up technology development, deployment, and environmental cleanup.

2077 (PNL-10474) Investigation of drum pressurization incident in the 331 Building, Room 175 on January 10, 1995. Pollari, R.A. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008492. Source: OSTI; NTIS; INIS; GPO Dep.

On January 10, 1995, a pressurized drum incident occurred at the 331 Building, Room 175. On January 12, 1995, the Manager of the Life Sciences Center appointed members to an Investigation Board to investigate the incident (see Exhibit A). This incident was initially categorized as an Off-Normal Occurrence, but was later elevated to an Unusual Occurrence by the Occurrence Classifier. The scope of this investigation was to employ a formal method of root cause analysis, identify the methodology, and report the results of the analysis, fully explaining the technical elements of the causal sequence along with a description of

the barriers that should have or could have prevented the occurrence. During the course of the investigation, the scene of the event was not accessible. Therefore, the investigation relied primarily on testimony from staff members directly involved and their management. In addition, other outside professionals were also consulted. The Investigation Board visited the previous location of the drum, 331A Building, Room 9; Room 173, which fronts room 175, was also visited. The Investigation Board reviewed selected documents, which are also listed.

2078 (PNL-SA-20502) Comparison of computer codes and inputs used at DOE sites to model intrusion scenarios. Seitz, R.R. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Cook, J.R.; Wood, M.I.; Rittman, P.D.; Wood, D.E.; Napier, B.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-920307-104: Waste management '92, Tucson, AZ (United States), 1-5 Mar 1992). Order Number DE95004899. Source: OSTI; NTIS; INIS; GPO Dep.

Scenarios and computer codes used to evaluate intrusion scenarios at different DOE sites are compared and discussed. The purpose of the comparison is to identify differences in the approaches and areas where approaches could be made more consistent without ignoring the need to consider legitimate site-specific differences. The comparison is comprised of two steps: (1) benchmarking of GENII and PATHRAE (the two most commonly used codes at DOE sites), and (2) comparison of assumed values for selected input parameters from scenarios used at the different sites. The results of the benchmarking and parameter comparisons identify fundamental differences in the default assumptions used in the computer codes, as well as differences in the approaches used at the different sites. GENII and PATHRAE are applied to a variety of sites within DOE and other regulatory environments, differences in default assumptions identified in these comparisons are discussed for users to consider when they apply the codes. Furthermore, differences in assumptions made at the different sites disposing of low-level radioactive wastes within Department of Energy are identified to provide an example of how the Performance Assessment Task Team is working to ensure consistent interpretation of performance assessment results.

2079 (PNL-SA-24036) Impacts on health and safety from transfer/consolidation of nuclear materials and hazardous chemicals. Gallucci, R.H.V. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941148-6: ANS meeting on environmental aspects of decommissioning, decontamination, and/or environmental restoration at nuclear and mixed waste facilities, Washington, DC (United States), 13-17 Nov 1994). Order Number DE95007281. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental restoration plans at the US Department of Energy (USDOE) Hanford Site calls for transfer/consolidation of "targets/threats," namely nuclear materials and hazardous chemicals. Reductions in the health and safety hazards will depend on the plans implemented. Pacific Northwest Laboratory (PNL) estimated these potential impacts, assuming implementation of the current reference plan and employing ongoing risk and safety analyses. The results indicated the potential for "significant" reductions in health and safety hazards in the long term (> 25 years) and

a potentially "noteworthy" reduction in health hazard in the short term (≤ 25 years).

2080 (PNL-SA-24239) Modular risk analysis for assessing multiple waste sites. Whelan, G. (Pacific Northwest Lab., Richland, WA (United States)); Buck, J.W.; Nazarali, A. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9406226-2: DOE integrated workshop from strategic planning to baseline and other objectives, Golden, CO (United States), 1-2 Jun 1994). Order Number DE95004972. Source: OSTI; NTIS; INIS; GPO Dep.

Human-health impacts, especially to the surrounding public, are extremely difficult to assess at installations that contain multiple waste sites and a variety of mixed-waste constituents (e.g., organic, inorganic, and radioactive). These assessments must address different constituents, multiple waste sites, multiple release patterns, different transport pathways (i.e., groundwater, surface water, air, and overland soil), different receptor types and locations, various times of interest, population distributions, land-use patterns, baseline assessments, a variety of exposure scenarios, etc. Although the process is complex, two of the most important difficulties to overcome are associated with (1) establishing an approach that allows for modifying the source term, transport, or exposure component as an individual module without having to re-evaluate the entire installation-wide assessment (i.e., all modules simultaneously), and (2) displaying and communicating the results in an understandable and useable manner to interested parties. An integrated, physics-based, compartmentalized approach, which is coupled to a Geographical Information System (GIS), captures the regional health impacts associated with multiple waste sites (e.g., hundreds to thousands of waste sites) at locations within and surrounding the installation. Utilizing a modular/GIS-based approach overcomes difficulties in (1) analyzing a wide variety of scenarios for multiple waste sites, and (2) communicating results from a complex human-health-impact analysis by capturing the essence of the assessment in a relatively elegant manner, so the meaning of the results can be quickly conveyed to all who review them.

2081 (PNL-SA-24285) The Department of Energy's Remedial Action Assessment System (RAAS): Decision support tools for performing streamlined feasibility studies. White, M.K. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94019189. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (DOE) faces the major task of cleaning up hundreds of waste sites across the nation, which will require completion of a large number of remedial investigation/feasibility studies (RI/FSs). The intent of each RI/FS is to characterize the waste problems and environmental conditions at the operable unit level, segment the remediation problem into manageable medium-specific and contaminant-specific pieces, define corresponding remediation objectives, and identify remedial response actions to satisfy those objectives. The RI/FS team can then identify combinations of remediation technologies that will meet the remediation objectives. Finally, the team must evaluate these remedial alternatives in terms of effectiveness, implementability, cost, and acceptability. The Remedial Action

Assessment System (RAAS) is being developed by Pacific Northwest Laboratory (PNL) to support DOE in this effort.

2082 (PNL-SA-24340) Practical issues in discriminating between environmental and occupational sources in a uranium urinalysis bioassay program. Long, M.P. (Pacific Northwest Lab., Richland, WA (United States)); Carbaugh, E.H.; Fairrow, N.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411105-4: 40. anniversary conference on bioassay, analytical and environmental radiochemistry, Cincinnati, OH (United States), 15-17 Nov 1994). Order Number DE95007160. Source: OSTI; NTIS; INIS; GPO Dep.

Workers at two Department of Energy facilities, the Pantex Plant in Texas and the Hanford Site in Washington, are potentially exposed to class Y depleted or natural uranium. Since trace amounts of uranium are naturally present in urine excretion, site bioassay programs must be able to discern occupational exposure from naturally occurring uranium exposure. In 1985 Hanford established a $0.2\text{-}\mu\text{g/d}$ environmental screening level for elemental uranium in urine; the protocol was based on log-normal probability analysis of unexposed workers. A second study of background uranium levels commenced in 1990, and experiences in the field indicated that there seemed to be an excessive number of urine samples with uranium above the screening level and that the environmental screening level should be reviewed. Due to unforeseen problems, that second study was terminated before the complete data could be obtained. Natural uranium in rock (by weight, 99.27% ^{238}U , 0.72% ^{235}U , and 0.006% ^{234}U) has approximately equal activity concentrations of ^{238}U and ^{234}U . Earlier studies, summarized by the U.S. Environmental Protection Agency in 51 FR 32068, have indicated that ^{234}U (via ^{234}Th) has a greater environmental mobility than ^{238}U and may well have a higher concentration in ground water. By assuming that the ^{238}U -to- ^{234}U ratio in the urine of nonoccupationally exposed persons should reflect the ratio of environmental levels, significant occupational exposure to depleted uranium would shift that ratio in favor of ^{238}U , allowing use of the ratio as a co-indicator of occupational exposure in addition to the isotope-specific screening levels. This approach has been adopted by Pantex. The Pacific Northwest Laboratory is studying the feasibility of applying this method to the natural and recycled uranium mixtures encountered at Hanford. The Hanford data included in this report represent work-in-progress.

2083 (RFP-4810) Comparative risk analysis for the Rocky Flats Plant integrated project planning. Jones, M.E.; Shain, D.I. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-940650-3: 19. annual conference and exposition of the National Association of Environmental Professionals (NAEP): global strategies for environmental issues, New Orleans, LA (United States), 12-15 Jun 1994). Order Number DE94011163. Source: OSTI; NTIS; INIS; GPO Dep.

The Rocky Flats Plant is developing, with active stakeholder a comprehensive planning strategy that will support transition of the Rocky Flats Plant from a nuclear weapons production facility to site cleanup and final disposition. Final disposition of the Rocky Flats Plant materials and contaminants requires consideration of the interrelated nature of

site-wide problems, such as material movement and disposition, facility and land use endstates, costs relative risks to workers and the public, and waste disposition. Comparative Risk Analysis employs both incremental risk and cumulative risk evaluations to compare risks from postulated options or endstates. These postulated options or endstates can be various remedial alternatives, or future endstate uses of federal agency land. Currently, there does not exist any approved methodology that aggregates various incremental risk estimates. Comparative Risk Analysis has been developed to aggregate various incremental risk estimates to develop a site cumulative risk estimate. This paper discusses development of the Comparative Risk Analysis methodology, stakeholder participation and lessons learned from these challenges.

2084 (SAND-94-0105C) A comparison between the IAEA Safety Series 6 thermal environment and a proposed alternative thermal environment. Wix, S.D. (GRAM, Inc., Albuquerque, NM (United States)); Koski, J.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225-44: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 Mar 1994). Order Number DE94007297. Source: OSTI; NTIS; INIS; GPO Dep.

The present regulations for packaging and transportation of radioactive materials, IAEA Safety Series No. 6; 1985, establish specific criteria for the thermal environment of a hypothetical accident. The regulation states: The scope of this paper is to examine the effects on modeling that result with the Fry proposed thermal boundary conditions. The examination is accomplished by comparing thermal model results using the current IAEA specified thermal environment and the Fry proposed thermal boundary conditions.

2085 (SAND-94-0203C) Integration of numerical analysis tools for automated numerical optimization of a transportation package design. Witkowski, W.R.; Eldred, M.S.; Harding, D.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409187-2: 5. AIAA/NASA/USAF/ISSMO symposium on multidisciplinary analysis and optimization conference, Panama City, FL (United States), 7-9 Sep 1994). Order Number DE94018737. Source: OSTI; NTIS; INIS; GPO Dep.

The use of state-of-the-art numerical analysis tools to determine the optimal design of a radioactive material (RAM) transportation container is investigated. The design of a RAM package's components involves a complex coupling of structural, thermal, and radioactive shielding analyses. The final design must adhere to very strict design constraints. The current technique used by cask designers is uncoupled and involves designing each component separately with respect to its driving constraint. With the use of numerical optimization schemes, the complex couplings can be considered directly, and the performance of the integrated package can be maximized with respect to the analysis conditions. This can lead to more efficient package designs. Thermal and structural accident conditions are analyzed in the shape optimization of a simplified cask design. In this paper, details of the integration of numerical analysis tools, development of a process model, nonsmoothness difficulties with the optimization of the cask, and preliminary results are discussed.

2086 (SAND-94-2703C) A Sandia National Laboratories decontamination and demolition success story. Miller, D.R.; Barber, D.S.; Lipka, G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941102-30: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95002189. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories/New Mexico (SNL/NM) has established a formal facility assessment, decontamination and demolition oversight process with the goal of ensuring that excess or contaminated facilities are managed in a cost-effective manner that is protective of human health and the environment. The decontamination and demolition process is designed so that all disciplines are consulted and have input from the initiation of a project. The committee consists of all essential Environmental, Safety and Health (ES and H) and Facilities disciplines. The interdisciplinary-team approach has provided a mechanism that verifies adequate building and site assessment activities are conducted. This approach ensures that wastes generated during decontamination and demolition activities are handled and disposed according to Department of Energy (DOE), Federal, state, and local requirements. Because of the comprehensive nature of the SNL decontamination and demolition process, the strategy can be followed for demolition, renovation and new construction projects, regardless of funding source. An overview of the SNL/NM decontamination and demolition process is presented through a case study which demonstrates the practical importance of the formal process.

2087 (SAND-94-2759) Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components. Lutz, J.D. (Sandia National Labs., Albuquerque, NM (United States)); Wheelis, W.T.; Gundiler, I.H. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007711. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories (SNL) is tasked to support the Department of Energy in the dismantlement and disposal of SNL designed weapon components. These components are sealed in a potting compound, and contain heavy metals, explosive, radioactive, and toxic materials in discrete sub-components. SNL developed and demonstrated a process to identify and remove the hazardous sub-components utilizing real-time radiography and abrasive water-jet cutting. The remaining components were then crushed, granulated, screened, and separated into an aluminum and a precious-and-base-metals fraction using air-tables. Plastics were further cleaned for disposal as non-hazardous waste. The New Mexico Bureau of Mines & Mineral Resources assisted SNL in investigation of size-reduction and separation technologies and in the development of a conceptual design for a mechanical separation system.

2088 (SAND-94-2759C) Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components. Gundiler, I.H. (New Mexico Bureau of Mines and Mineral Resources, Socorro, NM (United States)); Lutz, J.D.; Wheelis, W.T. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940204-11: 123. annual meeting

of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE95002187. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories (SNL) is tasked to support The Department of Energy in the dismantlement and disposal of SNL designed weapon components. These components are sealed in a potting compound, and contain heavy metals, explosive, radioactive, and toxic materials. SNL developed a process to identify and remove the hazardous sub-components utilizing real-time radiography and abrasive water-jet cutting. The components were then crushed, granulated, screened, and separated into an aluminum and a precious-and-base-metals fraction using air-tables. Plastics were further cleaned for disposal as non-hazardous waste. New Mexico Bureau of Mines and Mineral Resources assisted SNL in investigation of size-reduction and separation technologies.

2089 (SAND-94-8002) Process Waste Assessment for the Plotting and Digitizing Support Laboratory. Phillips, N.M. Sandia National Labs., Livermore, CA (United States). Apr 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94011627. Source: OSTI; NTIS; INIS; GPO Dep.

This Process Waste Assessment was conducted to evaluate the Plotting and Digitizing Support Laboratory, located in Building 913, Room 157. It documents the processes, identifies the hazardous chemical waste streams generated by these processes, recommends possible ways to minimize waste, and serves as a reference for future assessments of this facility.

2090 (SAND-95-0143C) Research and Development Program for transportation packagings at Sandia National Laboratories. Hohnstreiter, G.F.; Sorenson, K.B. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950646-6: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95006819. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains information about the research and development programs dealing with waste transport at Sandia National Laboratories. This paper discusses topics such as: Why new packaging is needed; analytical methodologies and design codes; evaluation of packaging components; materials characterization; creative packaging concepts; packaging engineering and analysis; testing; and certification support.

2091 (SAND-95-0437C) Interactive development of RADTRAN. Neuhauser, K.S. (Sandia National Labs., Albuquerque, NM (United States)); Kanipe, F.L.; Weiner, R.F.; Yoshimura, H.R.; Joy, H.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-78: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008530. Source: OSTI; NTIS; INIS; GPO Dep.

The RADTRAN computer code for transportation risk analysis, which has been under continuous development at Sandia National Laboratories since 1977, has evolved from a purely research tool into a publicly available with a variety of applications. This expansion of the user community has substantially increased the need to make the system easier to use without decreasing its capabilities or the quality of

output. A large set of modifiable RADTRAN input files has been available via TRANSNET for several years. One approach to assisting the user involves adding annotations/information to each of these files. A second approach is providing additional help in building new/modifying old input files. Keeping the proposed information/annotation files separate from but closely coupled to the modifiable input files within the TRANSNET shell system allows the modifiable input files to remain as regular input files while providing rapid, automatic access to, useful information about the analysis. In this way, the sample input files remain intact as regular RADTRAN input files and any files generated using associated on-line menus or editors may be readily converted into new input files. A single sample file is selected and used as an example to illustrate the prototype help features.

2092 (SAND-95-0759C) Extra-regulatory Impact tests and analyses of the structural evaluation test unit. Ludwigsen, J.S.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740-32: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95011015. Source: OSTI; NTIS; INIS; GPO Dep.

The structural evaluation test unit is roughly equivalent to a 1/3 scale model of a high level waste rail cask. The test unit was designed to just meet the requirements of NRC Regulatory Guide 7.6 when subjected to a 9 m (30 ft) free drop resulting in an impact velocity of 13.4 m/s (30 mph) onto an unyielding target in the end-on orientation. The test unit was then subjected to impacts with higher velocities to determine the amount of built-in conservatism in this design approach. Test impacts of 13.4, 20.1 and 26.8 m/s (30, 45, and 60 mph) were performed. This paper will describe the design, testing, and comparison of measured strains and deformations to the equivalent analytical predictions.

2093 (SAND-95-0834C) Radioactive material transportation package design using numerical optimization techniques. Harding, D.C.; Eldred, M.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740-31: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95011016. Source: OSTI; NTIS; INIS; GPO Dep.

Increasing computational speed has led to the development and use of sophisticated numerical methods in radioactive material (RAM) transportation container design. The design of a RAM container often involves a complex coupling of structural, thermal, and radioactive shielding analyses. Sandia National Laboratories has integrated automatic mesh generation, explicit structural finite element analysis, transient thermal finite element analysis, and numerical optimization techniques into a unified RAM container design tool to increase the efficiency of both the design process and the resultant design through coupled analyses. Although development of this technique has progressed significantly, inaccurate numerical gradients due to design space nonsmoothness and excessive computational time have hampered successful implementation of numerical optimization as a "black box" design tool. This paper presents the details of analysis tool integration, simplified model development, constraint boundary nonsmoothness difficulties, and numerical optimization results for a lightweight

composite-overpack Type B RAM package subject to dynamic crush and fuel fire accident condition constraints.

2094 (UCRL-JC-118797-Rev.1) **A probabilistic risk assessment of the LLNL Plutonium Facility's evaluation basis fire operational accident. Revision 1.** Brumburgh, G.P. Lawrence Livermore National Lab., CA (United States). 27 Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950740-1-Rev.1: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95009529. Source: OSTI; NTIS; INIS; GPO Dep.

The Lawrence Livermore National Laboratory (LLNL) Plutonium Facility conducts numerous programmatic activities involving plutonium to include device fabrication, development of improved and/or unique fabrication techniques, metallurgy research, and laser isotope separation. A Safety Analysis Report (SAR) for the building 332 Plutonium Facility was completed in July 1994 to address operational safety and acceptable risk to employees, the public, government property, and the environment. This paper outlines the PRA analysis of the Evaluation Basis Fire (EBF) operational accident. The EBF postulates the worst-case programmatic impact event for the Plutonium Facility.

2095 (WHC-EP-0446-2) **Quality Assurance Project Plan for Facility Effluent Monitoring Plan activities.** Frazier, T.P. Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002361. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Project Plan addresses the quality assurance requirements for the activities associated with the Facility Effluent Monitoring Plans, which are part of the overall Hanford Site Environmental Protection Plan. This plan specifically applies to the sampling and analysis activities and continuous monitoring performed for all Facility Effluent Monitoring Plan activities conducted by Westinghouse Hanford Company. It is generic in approach and will be implemented in conjunction with the specific requirements of the individual Facility Effluent Monitoring Plans.

2096 (WHC-EP-0467-Rev.1) **Facility effluent monitoring plan for the B plant.** Lesser, J.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002474. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the U.S. Department of Energy in DOE Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438-1. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements. This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated every three years.

2097 (WHC-EP-0468-3) **Facility effluent monitoring plan for the plutonium uranium extraction facility.** Wiegand, D.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 346p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001031. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the US Department of Energy in DOE Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438-01. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements. This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated at a minimum of every three years.

2098 (WHC-EP-0549-Vol.3-4) **Hanford Strategic Analysis Study. Volumes 3 and 4.** Pajunen, A.L. (and others); Allen, G.K.; Carlson, A.B. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 285p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010947. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Strategic Analysis study presents comparisons of alternative cleanup strategies for the Hanford Site. Material balances, estimating the bulk flow and distribution of chemicals and radionuclides flowing through process blocks modeling disposition of the overall Site inventory, form the primary description of each alternative. Comparison parameters, such as overall life cycle costs, are then derived from the material balances. The purpose of Volume 2 of the Hanford Strategic Analysis (HSA) Study is to describe and discuss comparisons of integrated process options for achieving alternative cleanup strategies. The integrated systems described and compared in this volume rely on merging elements described in the other volumes of the HSA Study. Volume 3 presents a description of the methods developed to model material flows and estimate comparison parameters that are discussed in this volume. The cleanup strategies considered are based on the development in Volume 4. A description of the inventory information and the alternative process elements available for material types disposition are also described in Volume 4. These elements are merged by the models described in Volume 3 to produce the integrated systems compared in this volume of the strategic analysis study. This report presents Volumes 3 and 4 of the Hanford Strategic Analysis.

2099 (WHC-EP-0573-2) **Westinghouse Hanford Company Operational Environmental Monitoring. Annual report, CY 1993.** Schmidt, J.W.; Johnson, A.R.; Markes, B.M.; McKinney, S.M.; Perkins, C.J. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 332p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019342. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of the Westinghouse Hanford Company near-facility operational environmental monitoring for 1993 in the 100, 200/600, and 300/400 Areas of the Hanford Site, in south-central Washington State. Surveillance activities included sampling and analyses of ambient air, surface water, groundwater, sediments, soil, and biota. Also, external radiation measurements and radiological surveys were taken at waste disposal sites, radiologically controlled areas, and roads. These activities were conducted to assess and control the effects of nuclear facilities and waste sites on the local environment. In addition, diffuse sources were monitored to determine compliance with Federal, State, and/or local regulations. In general, although effects from nuclear facilities are still seen on the Hanford Site and radiation levels are slightly elevated when compared to offsite conditions, the differences are less than in previous years. At certain locations on or directly adjacent to nuclear facilities and waste sites, levels can be several times higher than offsite conditions.

2100 (WHC-EP-0829) Estimation and characterization of decontamination and decommissioning solid waste expected from the Plutonium Finishing Plant. Millar, J.S. (and others); Pottmeyer, J.A.; Stratton, T.J. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 236p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005056. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of the study was to estimate the amounts of equipment and other materials that are candidates for removal and subsequent processing in a solid waste facility when the Hanford Plutonium Finishing Plant is decontaminated and decommissioned. (Building structure and soil are not covered.) Results indicate that ~5,500 m³ of solid waste is expected to result from the decontamination and decommissioning of the Pu Finishing Plant. The breakdown of the volumes and percentages of waste by category is 1% dangerous solid waste, 71% low-level waste, 21% transuranic waste, 7% transuranic mixed waste.

2101 (WHC-EP-0850) Hanford Facility Resource Conservation and Recovery Act Permit General Inspection Plan. Beagles, D.S. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008034. Source: OSTI; NTIS; INIS; GPO Dep.

This inspection plan describes the activities that shall be conducted for a general inspection of the Hanford Facility. RCRA includes a requirement that general facility inspections be conducted of the 100, 200 East, 200 West, 300, 400, and 1100 areas and the banks of the Columbia River. This plan meets the RCRA requirements and also provides for scheduling of inspections and defines general and specific items to be noted during the inspections.

2102 (WHC-MR-0418) Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site. Johnson, A.R.; Markes, B.M.; Schmidt, J.W.; Shah, A.N.; Weiss, S.G.; Wilson, K.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001986. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes and reports a literature search of 85 environmental monitoring records of wildlife and vegetation (biota) at the 200 East Area and the 200 West Area of

the Hanford Site since 1965. These records were published annually and provided the majority of the data in this report. Additional sources of data have included records of specific facilities, such as site characterization documents and pre-operational environmental surveys. These documents have been released for public use. Records before 1965 were still being researched and therefore not included in this document. The intent of compiling these data into a single source was to identify past and current concentrations of radionuclides in biota at specific facilities and waste sites within each operable unit that may be used to help guide cleanup activities in the 200 Areas to be completed under the Comprehensive Environmental Response and Liability Act (CERCLA). The 200 East Area and 200 West Area were the locations of the Hanford Site separation and process facilities and waste management units. For the purposes of this document, a sample was of interest if a Geiger-Mueller counter equipped with a pancake probe indicated beta/gamma emitting radioactivity above 200 counts per minute (cpm), or if laboratory radioanalyses indicated a radionuclide concentration equaled or exceeded 10 picocuries per gram (pCi/g). About 4,500 individual cases of monitoring for radionuclide uptake or transport in biota in the 200 Areas environs were included in the documents reviewed. About 1,900 (i.e., 42%) of these biota had radionuclide concentrations in excess of 10 pCi/g. These radionuclide transport or uptake cases were distributed among 45 species of wildlife (primarily small mammals and feces) and 30 species of vegetation. The wildlife species most commonly associated with radioactive contamination were the house mouse and the deer mouse and of vegetation species, the Russian thistle.

2103 (WHC-MR-0452) Dramatic change at T Plant. Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013882. Source: OSTI; NTIS; INIS; GPO Dep.

T Plant (221-T) was the first and largest of the early chemical separations plants at the Hanford Engineer Works (HEW), the name for the Hanford Site during World War II. Officially designated as a Cell Building by the Manhattan Engineer District (MED) of the Army Corps of Engineers (agency responsible for HEW), T Plant served as the headquarters of chemical processing operations at Hanford from its construction until the opening of the Reduction-Oxidation (REDOX) Plant in January 1952. T Plant performed the third step in plutonium production operations, following the steps of uranium fuel manufacture and then irradiation in defense production reactors. The fissionable core (plutonium) used in the world's first atomic explosion, the Trinity bomb test held at Alamogordo, New Mexico, on July 16, 1945, was processed in T Plant. Likewise, the fissionable core of the weapon dropped over Nagasaki, Japan, on August 9, 1945, was processed in T Plant. Because it formed a crucial link in the first full-scale plutonium production operations in world history, T Plant meets criteria established in the National Historic Preservation Act of 1966 as a Historic Place.

2104 (WHC-MR-0452-Add.1) A brief history of the T Plant facility at the Hanford Site: Addendum 1. Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). 16 May 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013881. Source: OSTI; NTIS; GPO Dep.

T Plant (221-T) was the first and largest of the early chemical separations plants at the Hanford Engineer Works (HEW) (World War II name for the Hanford Site). Officially designated as a Cell Building by the Manhattan Engineer District (MED) of the Army Corps of Engineers (agency responsible for HEW), T Plant served as the headquarters of chemical processing operations at Hanford from its construction until the opening of the REDOX Plant in January 1952. Because it formed a crucial link in the first full-scale plutonium production operations in world history, it meets criteria established in the National Historic Preservation Act of 1966 as a National Historic Structure.

2105 (WHC-MR-0463) Training plan for the 1164 <90-day non-radioactive hazardous waste storage building. Demarest, J.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015332. Source: OSTI; NTIS; GPO Dep.

In accordance with Washington Administrative Code (WAC), Chapter 173-303, "Dangerous Waste Regulations," a written training plan is required for a <90-day accumulation area. WAC 173-303-200, "Accumulating Dangerous Waste on-site" requires compliance with WAC 173-303-330, Personnel Training. This training plan complies with WAC 173-303-330. This training plan, including the names of personnel in Table 1, may be given to a regulatory agency inspector upon request provided that this plan is cleared for public release. Training records associated with personnel identified in this plan are not to be given to an outside regulatory agency inspector unless prior approval by the specific individual is obtained. Training records requests by regulatory agency inspectors without the individual's approval are to be processed via a Freedom of Information Act request through the US Department of Energy, Richland Field Office.

2106 (WHC-MR-0465) History of the 185-/189-D thermal hydraulics laboratory and its effects on reactor operations at the Hanford Site. Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000732. Source: OSTI; NTIS; INIS; GPO Dep.

The 185-D deaeration building and the 189-D refrigeration building were constructed at Hanford during 1943 and 1944. Both buildings were constructed as part of the influent water cooling system for D reactor. The CMS studies eliminated the need for 185-D function. Early gains in knowledge ended the original function of the 189-D building mission. In 1951, 185-D and 189-D were converted to a thermal-hydraulic laboratory. The experiments held in the thermal-hydraulic lab lead to historic changes in Hanford reactor operations. In late 1951, the exponential physics experiments were moved to the 189-D building. In 1958, new production reactor experiments were begun in 185/189-D. In 1959, Plutonium Recycle Test Reactor experiments were added to the 185/189-D facility. By 1960, the 185/189-D thermal hydraulics laboratory was one of the few full service facilities of its type in the nation. During the years 1961-1963 tests continued in the facility in support of existing reactors, new production reactors, and the Plutonium Recycle Test Reactor. In 1969, Fast Flux Test Facility developmental testings began in the facility. Simulations in 185/189-D building aided in the N Reactor repairs in the 1980's. In 1994 the facility was nominated to the National Register

of Historic Places, because of its pioneering role over many years in thermal hydraulics, flow studies, heat transfer, and other reactor coolant support work. During 1994 and 1995 it was demolished in the largest decontamination and decommissioning project thus far in Hanford Site history.

2107 (WHC-SA-2077) 308 Building Zone I stabilization and confinement. Metcalf, I.L.; Schwartz, K.E.; Rich, J.W.; Benecke, M.W.; Rasmussen, D.E. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310264-4: 1993 plutonium/uranium recovery operations conference, Augusta, GA (United States), 18-21 Oct 1993). Order Number DE94013573. Source: OSTI; NTIS; INIS; GPO Dep.

The 308 Building (Fast Flux Test Facility [FFTF] fuel supply) at the Hanford Site, located in Richland, Washington, is currently in transition to shutdown status. After shutdown, the facility will be maintained/surveilled and turned over to the U.S. Department of Energy (DOE) Office of Facility Transition and Management (EM-60) for utilization, remedial action, or decontamination and decommissioning (D&D). This may require that the facility be maintained in the shutdown mode for up to 30 years. To date, all of the special nuclear material (SNM) has been removed from the facility, potential fuel supply equipment has been preserved, surplus materials and equipment have been excessed, and enclosure cleanup and stabilization has begun. Shutdown planning has been completed, which outlines the major tasks, scope, methodology, and timing for the shutdown activities. A major activity in support of the 308 Building shutdown is the cleanup and stabilization of the enclosures and surface contamination areas. This document identifies the specific designs, processes, and methods to stabilize and confine the radiological material within the enclosures and exhaust ducts to allow shutdown of the active support systems. The designs and steps planned will be effective, are simple, and make maximum use of current technologies and commercial items.

2108 (WHC-SA-2141) Seismic qualification of ventilation stack. Chen, W.W.; Huang, S.N.; Lindquist, M.R. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940613-27: 1994 pressure vessels and piping conference, Minneapolis, MN (United States), 19-23 Jun 1994). Order Number DE95001987. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the method to be used to qualify the 105 K ventilation stack at the U.S. Department of Energy's Hanford Site, near Richland, Washington, under seismic and wind loadings. The stack stands at 175 ft (53.34 m), with a diameter tapering from 22 ft (6.71 m) at the foundation to 12.83 ft (3.91 m) at the top. Although the stack is classified as Safety Class 3 (low hazard), it is treated as a Safety Class 1 (high hazard) component, as failure could damage a Safety Class 1 facility (the irradiated fuel storage basin). The evaluation used U.S. Department of Energy criteria specified in UCRL 15910 (1990). The seismic responses of the stack under earthquake loading were obtained from modal analyses with response spectrum input that used the ANSYS (1989) finite-element computer code. The moments and shear forces from the results of seismic analysis were used to qualify the reinforcement capacity of the stack structure by the ultimate-strength method. The wind forces acting on the stack in both along-wind and crosswind directions were

also calculated. Presented are evaluations of the soil bearing pressure, the moment, and the shear capacity of the stack foundation.

2109 (WHC-SA-2403) 308 Building zone I stabilization and confinement. Metcalf, I.L.; Schwartz, K.E.; Rich, J.W.; Benecke, M.W.; Lanham, G.W. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9402105-1: 6. annual meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1994). Order Number DE95000797. Source: OSTI; NTIS; INIS; GPO Dep.

The 308 Building located on the Hanford Site near Richland, Washington, is currently in transition to shutdown status. After this transition is complete, the facility will be maintained/surveilled and given to the U.S. Department of Energy Office of Facility Transition and Management (EM-60) for utilization, remedial action, or decontamination and decommissioning (D&D). This may require that the facility be maintained in the shutdown status for as long as 30 yrs. To date, all of the special nuclear material (SNM) has been removed, potential fuel supply equipment preserved, surplus materials and equipment excessed, and enclosure cleanup and stabilization completed. A major activity in support of the 308 Building shutdown was the cleanup and stabilization of the enclosures and surface contamination areas. This document discusses the specific designs, processes, and methods used to stabilize and confine the radiological material within the enclosure and exhaust ducts to allow the shutdown of the active support systems. The process and designs employed were effective, yet simple, and maximized the use of current technologies and commercial products.

2110 (WHC-SA-2413) The role of Quality Oversight in nuclear and hazardous waste management and environmental restoration at Westinghouse Hanford Company. Fouad, H.Y. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-52: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94014637. Source: OSTI; NTIS; INIS; GPO Dep.

The historical factors that led to the waste at Hanford are outlined. Westinghouse Hanford Company mission and organization are described. The role of the Quality Oversight organization in nuclear hazardous waste management and environmental restoration at Westinghouse Hanford Company is delineated. Tank Waste Remediation Systems activities and the role of the Quality Oversight organization are described as they apply to typical projects. Quality Oversight's role as the foundation for implementation of systems engineering and operation research principles is pointed out.

2111 (WHC-SA-2491) Packaging and transportation of radioactive liquid at the U.S. Department of Energy Hanford Site. Smith, R.J. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950426-1: 3. international conference on nuclear engineering, Kyoto (Japan), 23-27 Apr 1995). Order Number DE95007791. Source: OSTI; NTIS; INIS; GPO Dep.

Beginning in the 1940's, radioactive liquid waste has been generated at the US Department of Energy (DOE) Hanford

Site as a result of defense material production. The liquid waste is currently stored in 177 underground storage tanks. As part of the tank remediation efforts, Type B quantity packagings for the transport of large volumes of radioactive liquids are required. There are very few Type B liquid packagings in existence because of the rarity of large-volume radioactive liquid payloads in the commercial nuclear industry. Development of aboveground transport systems for large volumes of radioactive liquids involves institutional, economic, and technical issues. Although liquid shipments have taken place under DOE-approved controlled conditions within the boundaries of the Hanford Site for many years, offsite shipment requires compliance with DOE, US Nuclear Regulatory Commission (NRC), and US Department of Transportation (DOT) directives and regulations. At the present time, no domestic DOE nor NRC-certified Type B packagings with the appropriate level of shielding are available for DOT-compliant transport of radioactive liquids in bulk volumes. This paper will provide technical details regarding current methods used to transport such liquids on and off the Hanford Site, and will provide a status of packaging development programs for future liquid shipments.

2112 (WHC-SA-2516) An example of a component replacement when applying ASME N509 and ASME N510 to older ventilation systems. Arndt, T.E. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940738-6: 23. DOE/NRC nuclear air cleaning and treatment conference, Buffalo, NY (United States), 25-28 Jul 1994). Order Number DE94015708. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an example of a component replacement (electric heater) when installed in an older ventilation system that was constructed before the issuance of ASME N509 and N510. Many of the existing ventilation systems at the Hanford Site were designed, fabricated, and installed before the issuance of ASME N509 and N510. Requiring the application of these codes to existing ventilation systems presents challenges to the engineer when design changes are needed. Although it may seem that the application of ASME N509 or N510 may be a hindrance at times, this does not need to occur. Proper preparation at the start of project or design modifications can minimize frustration to the engineer when it is judged that portions of ASME N509 and N510 do not apply in a particular application.

2113 (WHC-SA-2559) A quality control program for waste disposal vault closure. Benny, H.L. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940985-6: American Society for Quality Control Energy and Environmental Quality Division conference, Tucson, AZ (United States), 18-21 Sep 1994). Order Number DE94017995. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides a review of the quality control program employed for closure for a radioactive waste disposal vault at Hanford Washington. The major elements of the program are discussed, as well as the testing results and lessons learned.

2114 (WHC-SA-2568) Type B drum packages. McCoy, J.C. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9408124-10: Transportation management annual

workshop, Rockville, MD (United States), 8-11 Aug 1994). Order Number DE94018153. Source: OSTI; NTIS; INIS; GPO Dep.

The Type B drum packages (TBD) are conceptualized as a family of containers in which a single 208 L or 114 L (55 gal or 30 gal) drum containing Type B quantities of radioactive material (RAM) can be packaged for shipment. The TBD containers are being developed to fill a void in the packaging and transportation capabilities of the U.S. Department of Energy as no container packaging single drums of Type B RAM exists offering double containment. Several multiple-drum containers currently exist, as well as a number of shielded casks, but the size and weight of these containers present many operational challenges for single-drum shipments. As an alternative, the TBD containers will offer up to three shielded versions (light, medium, and heavy) and one unshielded version, each offering single or optional double containment for a single drum. To reduce operational complexity, all versions will share similar design and operational features where possible. The primary users of the TBD containers are envisioned to be any organization desiring to ship single drums of Type B RAM, such as laboratories, waste retrieval activities, emergency response teams, etc. Currently, the TBD conceptual design is being developed with the final design and analysis to be completed in 1995 to 1996. Testing and certification of the unshielded version are planned to be completed in 1996 to 1997 with production to begin in 1997 to 1998.

2115 (WHC-SA-2583) DOE TMD transportation training module 14 transportation of explosives. Griffith, R.L. Jr. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9408124-11: Transportation management annual workshop, Rockville, MD (United States), 8-11 Aug 1994). Order Number DE94018689. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy Transportation Management Division has developed training module 14, entitled "Transportation of Explosives" to compliment the basic "core ten" training modules of the Hazardous Materials Modular Training Program. The purpose of this training module is to increase awareness of the Department of Transportation (DOT) requirements concerning the packaging and transportation of explosives. Topics covered in module 14 include the classification of explosives, approval and registration of explosives, packaging requirements, hazard communication requirements, separation and segregation compatibility requirements, loading and unloading operations, as well as safety measures required in the event of a vehicle accident involving explosives.

2116 (WHC-SA-2587) Cesium return program lessons learned FY 1994. Clements, E.P. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9408139-1: Transportation management Division workshop, Rockville, MD (United States), 8 Aug 1994). Order Number DE94018155. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) is returning leased cesium capsules from IOTEC, Incorporated (IOTEC), Northglenn, Colorado, and the Applied Radiant Energy Company (ARECO), Lynchburg, Virginia, to the Waste Encapsulation and Storage Facility (WESF) on the Hanford Site, to ensure safe management and storage, pending final

capsule disposition. Preparations included testing and modifying the Beneficial Uses Shipping System (BUSS) cask, preparing an Environmental Assessment (EA), development of a comprehensive Transportation Plan, coordination with the Western Governors' Association (WGA) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and interface with the public and media. Additional activities include contracting for a General Electric (GE) 2000 cask to expedite IOTEC capsule returns, and coordination with Eastern and Midwestern States to revise the transportation plan in support of ARECO capsule returns.

2117 (WHC-SA-2621) The Fast Flux Test Facility shutdown program plan. Guttenberg, S.; Jones, D.H.; Midgett, J.C.; Nielsen, D.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-37: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95006799. Source: OSTI; NTIS; INIS; GPO Dep.

The Fast Flux Test Facility (FFTF) is a 400 MWt sodium-cooled research reactor owned by the US Department of Energy (DOE) and operated by the Westinghouse Hanford Company (WHC) on the Hanford Site in southeastern Washington State. The decision was made by the DOE in December, 1993, to initiate shutdown of the FFTF. This paper describes the FFTF Transition Project Plan (1) (formerly the FFTF Shutdown Program Plan) which provides the strategy, major elements, and project baseline for transitioning the FFTF to an industrially and radiologically safe shutdown condition. The Plan, and its resource loaded schedule, indicate this transition can be achieved in a period of six to seven years at a cost of approximately \$359 million. The transition activities include reactor defueling, fuel offload to dry cask storage, sodium drain and reaction, management of sodium residuals, shutdown of auxiliary systems, and preparation of appropriate environmental and regulatory documentation. Completion of these activities will involve resolution of many challenging and unique issues associated with shutdown of a large sodium reactor facility. At the conclusion of these activities, the FFTF will be in a safe condition for turnover to the Hanford Site Environmental Restoration Contractor for a long term surveillance and maintenance phase and decommissioning.

2118 (WHC-SA-2633) Snubber reduction analysis of secondary hot leg in Fast Flux Test Facility. Chen, W.W.; Lindquist, M.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950740-8: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95006629. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes analyses to qualify the structural integrity of the secondary hot leg (SHL) dump heat exchanger (DHX) piping system of the Fast Flux Test Facility (FFTF) under seismic loading after the deletion of a number of seismic snubbers. A baseline geometric model was developed, with ADLPIPE computer code, Version 2EIA, 1984. Several seismic analyses were performed by iteration with the maximum number of snubbers reduced to obtain a support configuration having acceptable anchor and support loads as well as acceptable piping stresses. A thermal analysis was performed at an operating temperature of 965°F

(518°C) to qualify the piping system following the replacement of some seismic snubbers with rigid supports. A series of displacements from flow- or pump-induced vibration were measured. These vibrations, on the order of tens of seconds or minutes apart, were not continuous and steady, but rather of a series of forced displacements that rapidly damped out to zero. A scoping evaluation of the effect of the vibration found that the calculated stress is within limits. Results of the stress analysis of the piping with snubber reduction are qualified in accordance with ASME, Section III, Class 1, requirements. Nearly 67% of the snubbers in loop 1 of the SHL piping system may be eliminated or replaced with rigid struts at the same location and orientation. The effects of inelastic strain accumulation, creep-fatigue damage and interaction, and elastic follow-up are evaluated by comparison to the results of inelastic analysis. Revised anchor and hanger loads also were evaluated by comparison to those from the original seismic analysis.

2119 (WHC-SA-2707) Description of the solid waste container corrosion program at the Hanford Site. Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304-12: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005478. Source: OSTI; NTIS; INIS; GPO Dep.

Waste management and environmental restoration are the Prime missions of the Hanford site, owned by the Department of Energy and operated by a management and operations contractor. The Site is located in southeast Washington State; its focus since World War II was the production of nuclear material to be used in atomic weapons but now is environmental cleanup. The cleanup of the site presents formidable challenges. The degradation of containers used to store radioactive and hazardous waste presents one of these challenges. Such containers, primarily 55 gallon (208 liter) drums, have been stored for eventual retrieval and re-packing for final disposal, some since 1970, in various types of environments. The expected degradation during storage must be estimated, verified, and predicted to allow prudent waste storage. Several programs have been put into place at the Hanford Site to facilitate corrosion measurement and prediction.

2120 (WHC-SA-2709) Team engineering for successful reuse and mission enhancement of a former DOE Weapons Material Production Facility. Blackford, L.T. (Westinghouse Hanford Co., Richland, WA (United States)); Mizner, J.H. Jr. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941102-37: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95003853. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the team engineering approach used to resolve issues associated with converting a 50-year-old fuel processing facility into a decontamination facility. In only nine months, the multi-disciplinary team formed for this task has made significant progress toward both long-term and short-term goals, including conceptual design of two decontamination modules. The team's accomplishments are even more notable in light of frequent changes in scope and

mission. Today, the team serves as a venue for troubleshooting operational issues, sharing vendor information, developing long-range strategies, and addressing integration issues within the facility's organizational structure. The team's approach could serve as a useful model to address the many issues surrounding the transition of the U.S. Department of Energy (DOE) and commercial complexes from a production and supply role to one of cleanup and environmental remediation.

2121 (WHC-SA-2729) Long term decontamination at the Hanford Site: A case study. Geuther, W.J. (Westinghouse Hanford Co., Richland, WA (United States)); Hansen, G.E. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941102-44: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95007795. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an engineering study that evaluates decontamination requirements at Hanford and the potential reutilization of the first plutonium processing production facility as a decontamination facility. The logic used to develop the study, the options available for a long-term decontamination mission, and the resultant strategy recommended in the study are presented. The paper provides a starting point for other similar study efforts. The process flowsheets, regulatory restrictions, and preconceptual designs developed in this study are common throughout the nuclear waste industry.

2122 (WHC-SA-2782) Methods to estimate equipment and materials that are candidates for removal during the decontamination of fuel processing facilities. Duncan, D.R. (Westinghouse Hanford Co., Richland, WA (United States)); Valero, O.J.; Hyre, R.A.; Pottmeyer, J.A.; Millar, J.S.; Reddick, J.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-122: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95008032. Source: OSTI; NTIS; INIS; GPO Dep.

The methodology presented in this report provides a model for estimating the volume and types of waste expected from the removal of equipment and other materials during Decontamination and Decommissioning (D and D) of canyon-type fuel reprocessing facilities. This methodology offers a rough estimation technique based on a comparative analysis for a similar, previously studied, reprocessing facility. This approach is especially useful as a planning tool to save time and money while preparing for final D and D. The basic methodology described here can be extended for use at other types of facilities, such as glovebox or reactor facilities.

2123 (WHC-SA-2784) High resolution seismic reflection test at the DOE Hanford Site. Narbutovskih, S.M. (Westinghouse Hanford Co., Richland, WA (United States)); Michelsen, F.B.; Clark, J.C.; Christensen, E.W. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950450-6: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL

(United States), 23-27 Apr 1995). Order Number DE95010851. Source: OSTI; NTIS; GPO Dep.

A recent test was conducted to ascertain the benefits of swept source technology for use at the DOE Hanford Site. Previous high resolution seismic surveys suffered from coherent noise interference, poor signal transmission and lack of borehole velocity control. P-wave data were collected with the T-2500 Minivib produced by IVI, Inc. and Oyo Geospace's DAS-1 acquisition system. Results showed a significant increase in signal-to-noise ratio, increased resolving power and better depth penetration of the signal. It is concluded that swept source technology as part of a total systems approach, significantly expands the capabilities of the shallow high resolution seismic reflection method for use at the DOE Hanford Site.

2124 (WHC-SD-C018H-HC-002-Rev.1) Hazard characterization report for the 200 Area Effluent Treatment Facility. Revision 1. Koerner, J.A. Westinghouse Hanford Co., Richland, WA (United States). 24 Apr 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011547. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the hazard categorization of the Effluent Treatment Facility ETF per DOE-STD-1027-92 and DOE-EM-STD-5502-94. The ETF is being built at the NE corner of the Hanford 200 East Area; it will treat process condensate generated at the 242-A Evaporator, which is used to reduce the volume of radioactive and hazardous wastes stored in double-shell tanks. The hazard categorization uses a radiological source term and inventory based on the ETF design basis inventory and characterization data.

2125 (WHC-SD-C018H-TP-010-Rev.1) C-018H LERF filtration test plan: Revision 1. Moberg, T.P.; King, C.V. Westinghouse Hanford Co., Richland, WA (United States). 26 Aug 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000456. Source: OSTI; NTIS; INIS; GPO Dep.

The following outlines the plan to test the polymeric backwash filtration system at the LERF. These tests will determine if the ETF filter design is adequate. If the tests show that the design is adequate, the task will be complete. If the tests show that the technology is inadequate, it may be necessary to perform further tests to qualify other candidate filtration technologies (e.g., polymeric tubular ultrafiltration, centrifugal ultrafiltration). The criteria to determine the success or failure of the backwash filter will be based on the system's ability to remove the bacteria and inorganic contaminants from the evaporator process condensate. The tests are designed to qualify the design basis of the filtration technology that will be used in the ETF.

2126 (WHC-SD-C217-ES-001) Plutonium finishing plant safeguards and security systems replacement study. Klear, P.F.; Humphrys, K.L. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 227p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006658. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the preferred alternatives for the replacement of the Safeguards and Security systems located at the Hanford Plutonium Finishing Plant.

2127 (WHC-SD-CP-ANAL-008) Fire modeling for Building 221-T - T Plant Canyon Deck and Railroad Tunnel. Oar, D.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 121p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006893. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared by Hughes Associates, Inc. to document the results of fire models for building 221-T Canyon Deck and Railroad Tunnel. Backup data is contained in document No. WHC-SD-CP-ANAL-010, Rev. 0.

2128 (WHC-SD-CP-ANAL-010) Attachments for fire modeling for Building 221-T, T Plant canyon deck and railroad tunnel. Oar, D.L. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Hughes Associates, Inc., Columbia, MD (United States). 23 Jan 1995. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006711. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this attachment is to provide historical information and documentation for Document No. WHC-SD-CP-ANAL-008 Rev 0, "Fire Modeling for Building 221-T-T Plant Canyon Deck and Railroad Tunnel", dated September 29, 1994. This data compilation contains the following: Resumes of the Technical Director, Senior Engineer and Junior Engineer; Review and Comment Record; Software Files; CFAST Input and Output Files; Calculation Control Sheets; and Estimating Sprinkler Actuation Time in the Canyon and Railroad Tunnel. The T Plant was originally a fuel reprocessing facility. It was modified later to decontaminate and repair PuRex process equipment.

2129 (WHC-SD-CP-DA-093) Slug bucket lifting yoke analysis. McElfresh, A.J. Westinghouse Hanford Co., Richland, WA (United States). 14 Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003765. Source: OSTI; NTIS; INIS; GPO Dep.

There are baskets of fuel in the storage pools in the Purex facility (202-A). These baskets (called slug buckets) need to be removed from Purex and taken to the K-Basins. The current slug bucket lifting yoke is of sufficient age to be in question structurally. Therefore new yokes need to be fabricated. Prior to fabricating new yokes, the slug bucket lifting yoke DWG needs to be updated for fabrication. However, the design needs to be refined so that the yoke will be easier to fabricate. These calculations are prepared to demonstrate the adequacy of the new design. The objective of these calculations is to select appropriately sized structural members and weld sizes to serve as components in the slug bucket lifting yoke.

2130 (WHC-SD-CP-ES-160) Seismic (SSE) evaluation for the 291Z stack at the Hanford Site - Addition of environmental monitoring penetrations. Baxter, J.T. Westinghouse Hanford Co., Richland, WA (United States). 31 Aug 1994. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019011. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this 291Z stack analysis is to determine the structural effects of chipping additional holes into the stacks concrete walls. The proposed holes are for new environmental monitoring sample probes to be installed at three different elevations. The approximate elevations proposed at this time are 50 ft, 135 ft and 175 ft. There will be four holes required at each of the elevations to support two sample probes extending across the diameter of the stack. A structural sensitivity study has been completed to assess the

effect of the proposed holes on the baseline seismic qualification of the stack completed by URS/John A. Blume & Associates, Engineers, San Francisco, California (URS/Blume) in August, 1988. Results of the sensitivity study indicate that the stack would still have adequate structural moment capacity if the new holes were drilled cutting the vertical strength reinforcing steel, or if existing penetrations added since original construction have inadvertently cut vertical rebars. For current and future modifications, no vertical rebar should be cut. A limited number of horizontal rebar, no more than 2, may be cut at the new hole locations without significantly influencing the stack structural shear capacity. New penetrations in the 291Z stack should not be located below elevation 47 ft., 4 in. due to rebar layout and the fact that maximum seismic structural loads occur below this elevation. No vertical rebar should be cut when chipping the new penetrations in the stack concrete wall for the environmental monitoring equipment. Wind load qualification was reviewed. Seismic loads govern over wind loads for all structural load cases; therefore no additional wind analyses are required.

2131 (WHC-SD-CP-ES-166) Engineering study on conveyor system for HC-21C project. De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007227. Source: OSTI; NTIS; INIS; GPO Dep.

The sludge stabilization process thermally stabilizes reactive plutonium bearing materials in a muffle furnace. This process is used to prepare the material for long term storage in the vaults. The process is conducted in Room 230A and 230B. The furnaces are located in glovebox HC-21C. Glovebox HC-21A is used for preparation of the charge and packaging of the high fired oxide. The feed for the process is located throughout the PRF and RMC-line gloveboxes, with over half of the feedstock currently being located in HA-23S. For readiness assessment, the sludge stabilization process at PFP was reviewed by the ALARA team to see how the process could be improved. One suggestion was made that the conveyor system be used to transfer items from HA-23S to the process glovebox (HA-21A) instead of sealing items in and out of the gloveboxes. The following discussion describes and compares past and current methods. In addition, actions are addressed that would need to be completed before the conveyor method could be used. The transportation of the feedstock to the process and all the different influencing factors will be examined to determine the best method. This assessment is being performed considering only the current campaign for HC-21C. However, there is a possibility that in the future, additional furnaces will be installed and further campaigns done.

2132 (WHC-SD-CP-HC-004) UO₃ building hazard classification - deactivated state. Dodd, E.N. III. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005069. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the hazards classification of UO₃ facility in the deactivated state.

2133 (WHC-SD-CP-HSP-002) PUREX Deactivation Health and Safety documentation. Dodd, E.N. III. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 130p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95005082. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the PUREX Deactivation Project is to establish a passively safe and environmentally secure configuration of PUREX at the Hanford Site, and to preserve that configuration for a 10-year horizon. The 10-year horizon is used to predict future maintenance requirements and represents their typical time duration expended to define, authorize, and initiate the follow-on Decontamination and Decommissioning (D&D) activities. This document was prepared to increase attention to worker safety issues during the deactivation project and, as such, identifies the documentation and programs associated with PUREX Deactivation Health and Safety.

2134 (WHC-SD-CP-MAR-001) Plutonium Finishing Plant Transition Project mission analysis report. Courson, D.B. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000991. Source: OSTI; NTIS; INIS; GPO Dep.

This report defines the mission for the Plutonium Finishing Plant Transition Project (PFPTP) using a systems engineering approach. This mission analysis will be the basis for the functional analysis which will further define and break down the mission statement into all of the detailed functions required to accomplish the mission. The functional analysis is then used to develop requirements, allocate those requirements to functions, and eventually be used to design the system. This report: presents the problem which will be addressed, defines PFP Transition Project, defines the overall mission statement, describes the existing, initial conditions, defines the desired, final conditions, identifies the mission boundaries and external interfaces, identifies the resources required to carry out the mission, describes the uncertainties and risks, and discusses the measures which will be used to determine success.

2135 (WHC-SD-CP-OMM-003) PFP MICON maintenance manual. Silvan, G.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004485. Source: OSTI; NTIS; INIS; GPO Dep.

This manual covers the use of maintenance displays, maintenance procedures, system alarms and common system failures.

2136 (WHC-SD-CP-OTP-152-Rev.1) Closed loop cooling operation with MICON. Revision 1. Navarro, G.E. Westinghouse Hanford Co., Richland, WA (United States). 18 Jan 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006657. Source: OSTI; NTIS; INIS; GPO Dep.

Document provides instructions for testing the closed loop cooling operation with the MICON Computer System at PFP.

2137 (WHC-SD-CP-PLN-027-Rev.1) Sampling and Analysis Plan for PUREX canyon vessel flushing. Villalobos, C.N. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008465. Source: OSTI; NTIS; INIS; GPO Dep.

A sampling and analysis plan is necessary to provide direction for the sampling and analytical activities determined

by the data quality objectives. This document defines the sampling and analysis necessary to support the deactivation of the Plutonium-Uranium Extraction (PUREX) facility vessels that are regulated pursuant to Washington Administrative Code 173-303.

2138 (WHC-SD-CP-RD-022-Rev.1) Bases for PUREX deactivation safety equipment list. Walser, R.L. Westinghouse Hanford Co., Richland, WA (United States). 21 Nov 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004431. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the basis and justification for changes in classification of equipment listed in WHC-SD-SEL-001 Rev 1, "PUREX Plant Safety Equipment List." The reference document will be re-issued as Rev 2 based on the DEACTIVATION mode as evaluated in this document. Systems, components, and structures are evaluated based on consequences of failure on the health and safety of the general public for Safety Class 1, the health and safety of the on-site worker for Safety Class 2, and the health and safety of the facility worker for Safety Class 3. The consequences of a failure on the environment are also addressed in this ranking based on the level of insult. The criteria for the three levels of Safety class equipment are given in Appendix I for ease of reference.

2139 (WHC-SD-CP-RPT-012-Rev.1) Report of clean out and flushing of UO₃ Plant processing equipment: Revision 1. Gonsalves, E. Westinghouse Hanford Co., Richland, WA (United States). 2 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004487. Source: OSTI; NTIS; INIS; GPO Dep.

The UO₃ Plant went through a clean out leading to the deactivation of the facility. This clean out consisted of three phases. Phase 1 consisted of the removal of residual process material and the deactivation of most process equipment and instrumentation. Phase 2 consisted of the fixing or removal of contamination so storm water processing would be no longer required. Phase 3 consisted of the remaining activities that had to be completed before the facility was turned over to the Surplus Facility Program. Since the activities of Phase 2 and 3 were closely related, these two phases were worked simultaneously. The first part of this document summarizes the Phase 1 clean out procedures and their results. Phase 1 was completed on February 28, 1994. The second part summarizes the Phase 2/3 clean out procedures and their results. Phase 2/3 was completed before December 31, 1994. Because tanks and equipment were flushed simultaneously or in a specific sequence, the clean out processes are discussed per workplan.

2140 (WHC-SD-CP-SA-023-Rev.1) Structural evaluation of the 2736Z Building for seismic loads. Giller, R.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003245. Source: OSTI; NTIS; INIS; GPO Dep.

The 2736Z building structure is evaluated for high-hazard loads. The 2736Z building is analyzed herein for normal and seismic loads and is found to successfully meet the guidelines of UCRL-15910 along with the related codes requirements.

2141 (WHC-SD-CP-SA-027) Seismic analysis of safety class 1 incinerator glovebox in building 232-Z 200 W Area. Ocoma, E.C. Westinghouse Hanford Co.,

Richland, WA (United States). Sep 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005280. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the seismic evaluation for the existing safety class 1 incinerator glovebox in 232Z Building. The glovebox is no longer in use and most of the internal mechanical equipment have been removed. However, the insulation firebricks are still in the glovebox for proper disposal.

2142 (WHC-SD-CP-SA-028) Walkdown procedure: Seismic adequacy review of safety class 3 & 4 commodities in 2736-Z & ZB buildings at PFP facility. Ocoma, E.C. Westinghouse Hanford Co., Richland, WA (United States). 29 Mar 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010143. Source: OSTI; NTIS; INIS; GPO Dep.

Seismic evaluation of existing safety class (SC) 3 and non-SC 4 commodities at the Plutonium Finishing Plant (PFP) is integrated into an area walkdown program. Field walkdowns of potential PFP seismic deficiencies associated with structural failure and falling will be performed using the DOE SQUG/EPRI methodology. Potential proximity interactions are also addressed. Objective of the walkdown is to qualify as much of the equipment as practical and to identify candidates for further evaluation.

2143 (WHC-SD-CP-SAR-021-Vol.1) Plutonium finishing plant final safety analysis report. Volume 1. Shapley, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 1327p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009101. Source: OSTI; NTIS; INIS; GPO Dep.

This Final Safety Analysis Report was approved by DOE-HQ on January 6, 1995. It replaces 14 older PFP safety analysis and incorporates several Safety Assessment Documents prepared in 1993 and 1994. A draft of this document dated January 1991 has been circulated - all pages of the approved Revision 0 are dated January 1995. Additionally, approval of this document by DOE-HQ closes an Unreviewed Safety Question related to 232-Z Incinerator Building that was identified in August, 1994. This document and its companion document, WHC-SD-CP-OSR-010, "Plutonium Finishing Plant Operational Safety Requirements," are the primary references for definition of the Plutonium Finishing Plant (PFP) safety authorization basis.

2144 (WHC-SD-CP-SAR-021-Vol.2) Plutonium finishing plant final safety analysis report. Volume 2. Shapley, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 1275p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009102. Source: OSTI; NTIS; INIS; GPO Dep.

This Final Safety Analysis Report was approved by DOE-HQ on January 6, 1995. It replaces 14 older PFP safety analysis and incorporates several Safety Assessment Documents prepared in 1993 and 1994. A draft of this document dated January 1991 has been circulated - all pages of the approved Revision 0 are dated January 1995. Additionally, approval of this document by DOE-HQ closes an Unreviewed Safety Question related to 232-Z Incinerator Building that was identified in August, 1994. This document and its companion document, WHC-SD-CP-OSR-010, "Plutonium

Finishing Plant Operational Safety Requirements," are the primary references for definition of the Plutonium Finishing Plant (PFP) safety authorization basis.

2145 (WHC-SD-CP-TC-031) Heat exchanger bypass test procedure. De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004162. Source: OSTI; NTIS; INIS; GPO Dep.

The HC-21C Muffle Furnace Process has been experiencing problems with corrosion of the off-gas piping system. During the processing cycle, condensation is forming and corroding the off-gas piping. The corrosion products build up in the rotameters and cause them to be dysfunctional. The condensation is suspected to be occurring in the heat exchanger, so the test will bypass the heat exchanger to verify this. This process test will help to establish a temperature profile for the off-gas system near the rotameter. Also, this information will be used to help determine the location and cause of water condensation that is occurring in the off-gas equipment. The process test will include operating one of the two furnaces in Room 230A to stabilize Pu bearing material. During the test run, various temperature readings will be taken and visual inspections done.

2146 (WHC-SD-CP-TC-032-Rev.1) HC-21C off-gas test procedure. Revision 1. Cunningham, L.T. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007224. Source: OSTI; NTIS; INIS; GPO Dep.

Stabilization of plutonium bearing scrap material occurs in furnaces, FUR-21C-1 and FUR-21C-2, located in glovebox HC-21C. During previous testing and processing operations, water has been observed forming in the off-gas rotameters, FI-21C-1 and FI-21C-2. The off-gas is filtered through a 2 micron ceramic filter, F-21C-1 or F-21C-2, before discharge into the 26 inch vacuum system. The goal of this test plan is to determine the cause and location of water formation in the sludge stabilization off-gas system. The results should help determine what design improvements or processing steps will be implemented to prevent this phenomena from occurring in the future.

2147 (WHC-SD-CP-TEEM-069) PFP up-right lift UL-20/26 manlifts. Morley, J.M. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003839. Source: OSTI; NTIS; INIS; GPO Dep.

This Technical Evaluation of Equipment Maintenance (TEEM) is provided principally to document vendor suggested maintenance requirements and deviations from vendor suggested requirements, and provide documentation to support PM procedures. As additional maintenance activities are identified, they will be documented in later revisions. This TEEM is applicable to four single-person manlifts. The report documents preventive maintenance evaluations, semi-annual checks, safety rules before the use of the manlifts, and routine service checks.

2148 (WHC-SD-CP-TI-108-Rev.14) Plutonium finishing plant safety systems and equipment list. Bergquist, G.G. Westinghouse Hanford Co., Richland, WA (United States). 6 Jan 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930.

Order Number DE95006780. Source: OSTI; NTIS; INIS; GPO Dep.

The Safety Equipment List (SEL) supports Analysis Report (FSAR), WHC-SD-CP-SAR-021 and the Plutonium Finishing Plant Operational Safety Requirements (OSRs), WHC-SD-CP-OSR-010. The SEL is a breakdown and classification of all Safety Class 1, 2, and 3 equipment, components, or system at the Plutonium Finishing Plant complex.

2149 (WHC-SD-CP-TI-193-Rev.1) Sludge stabilization campaign blend plan. Revision 1. De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 9 Mar 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010054. Source: OSTI; NTIS; INIS; GPO Dep.

This Sludge Stabilization Blend Plan documents the material to be processed and the order of processing for the FY95 Sludge Stabilization Campaign. The primary mission of the process is to reduce the inventory of unstable plutonium bearing sludge. The source of the sludge is residual and glovebox sweepings from the production of material at the Plutonium Finishing Plant (PFP). The reactive sludge is currently being stored in various gloveboxes at PFP. The sludge is to be thermally stabilized in a glovebox in room 230A of the 234-5Z building and materials handling for the process will be done in room 230B of the same building. The campaign is scheduled for approximately 10 months. A total of roughly 23 kg of Pu will be processed.

2150 (WHC-SD-CP-TI-194) UO₃ plant turnover - facility description document. Clapp, D.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005075. Source: OSTI; NTIS; INIS; GPO Dep.

This document was developed to provide a facility description for those portions of the UO₃ Facility being transferred to Bechtel Hanford Company, Inc. (BHI) following completion of facility deactivation. The facility and deactivated state condition description is intended only to serve as an overview of the plant as it is being transferred to BHI.

2151 (WHC-SD-CP-TP-082) Loss/gain on Ignition testing for HC-21C. De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005220. Source: OSTI; NTIS; INIS; GPO Dep.

The HC-21C thermal stabilization process stabilizes reactive plutonium bearing material for long term storage. A Loss On Ignition (LOI) analysis is performed on all materials that are stabilized in the muffle furnaces prior to being stored in the vaults to ensure suitability for vault storage. The material is required to have a LOI of less than 1% (OSD-184-00013 Limit). The LOI analysis is performed to assure that all volatiles that could potentially pressurize the sealed containers over long periods of time, like water, have been removed. It is possible, while performing LOI analysis to see a Gain On Ignition (GOI) due to additional oxidation of materials. In the current stabilization campaign, two items processed have had a positive LOI or GOI result. One concern with a GOI is that the weight gain may actually be masking a weight loss. (Reference 15530-94-WSL-156). Other concerns with a GOI result are that the removal of the oxygen could create a vacuum in the product can causing it to collapse during long term storage or the oxidation of material would increase the volume of the solids potentially

bulging or rupturing the product container. In the past, GOIs have been seen on items that were processed through Hoskin's pot furnaces located in glovebox HA-211. This test plan provides instruction to test causes of a GOI and to ensure the processed material with a GOI result will not cause a problem during long term storage. Product cans that are sampled for LOI and have results showing a gain of weight will be the test items.

2152 (WHC-SD-CP-TP-083) Test plan for non-radioactive testing of vertical calciner for development of direct denitration conversion of Pu-bearing liquors to stable, storage solids. Fisher, F.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010091. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium-bearing liquors, including ANL scrap liquors, will be used for development and demonstration of a vertical calciner direct denitration process for conversion of those liquors to stable, storable PuO₂-rich solids. This test plan is to test with non-radioactive stand-in materials to demonstrate adequate performance of the vertical calciner and ancillary equipment.

2153 (WHC-SD-CP-TP-084) Sludge stabilization boat material test plan. De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 5 Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010190. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides instructions for testing different types of potential boat materials in the HC-21C muffle furnace process. The boats must withstand corrosive environments at up to 1000 degrees C.

2154 (WHC-SD-CP-TRP-060) Heat exchanger bypass test report. De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 26 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006781. Source: OSTI; NTIS; INIS; GPO Dep.

This test report documents the results that were obtained while conducting the test procedure which bypassed the heat exchangers in the HC-21C sludge stabilization process. The test was performed on November 15, 1994 using WHC-SD-CP-TC-031, "Heat Exchanger Bypass Test Procedure." The primary objective of the test procedure was to determine if the heat exchangers were contributing to condensation of moisture in the off-gas line. This condensation was observed in the rotameters. Also, a secondary objective was to determine if temperatures at the rotameters would be too high and damage them or make them inaccurate without the heat exchangers in place.

2155 (WHC-SD-EN-AP-166) Description of work for 216-U-1 and 216-U-2 stainless steel pipeline integrity testing. Wasemiller, M.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015706. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of this integrity test are to (1) inspect the interior of this pipeline by in-line camera survey and (2) if required, conduct a pressure test on a section of the pipeline. The U-1 and U-2 Cribs were constructed in 1951. From March 1952 to June 1967, the site received cell drainage from Tank 5-2 in the 221-U Building and waste from the 224-U

Building via the overflow from the 241-U-361 Settling Tank. From June 1957 to July 1957, the site received waste from the 224-U Building via the overflow from the 241-U-361 Settling Tank and contaminated solvent from the 276-U Settling Tank solvent storage area. The discharge of 221-U waste was discontinued during shutdown of production operations. From July 1957 to May 1967, the site received waste from the 224-U Building and equipment decontamination and reclamation wastes from operations in the 221-U Building canyon. The scope of work is encompassed in five steps: (1) obtaining access to the pipeline in order to perform an in-line camera survey of the line to the greatest extent possible, (2) evaluating the need for further investigation of the pipeline, (3) blanking the line, as needed, to perform a pressure test, (4) conducting the pressure test, as needed, and (5) documenting the ability of the line to maintain pressure.

2156 (WHC-SD-EN-AP-171) Sampling and analysis plan for RCRA closure activities at 218-E-8 Borrow Pit Demolition Site. Lucas, J.G. Westinghouse Hanford Co., Richland, WA (United States). 2 Jun 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010675. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this document is to provide guidance for sampling and analysis activities associated with the proposed Resource Conservation and Recovery Act of 1976 (RCRA) clean closure of the 218-E-8 West Ash Pit Demolition Site. The borrow pit was used for demolition of discarded explosive chemicals, asbestos disposal, tumbleweed incineration, and storage of hazardous waste. Soil samples will be taken from around the blasting pit, to verify that the concentrations of all detonation activity contaminants are below action levels.

2157 (WHC-SD-EN-AP-172) Sampling and analysis plan for RCRA closure activities at 200 West Ash Pit Demolition Site. Lucas, J.G. Westinghouse Hanford Co., Richland, WA (United States). 2 Jun 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010674. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance for sampling and analysis activities associated with the proposed Resource Conservation and Recovery Act of 1976 (RCRA) clean closure of the 200 West Ash Pit Demolition Site. Soil samples will be taken around the blasting pit, in order to verify that the concentrations of all detonation activity contaminants are below action levels. The borrow pit was used for demolition of discarded explosive chemicals, tumbleweed incineration, and as a source of soil for construction material. The demolition site was located apart from the others within the borrow pit.

2158 (WHC-SD-EN-AP-177) Phase 1 sampling and analysis plan for the 304 Concretion Facility closure activities. Adler, J.G. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000798. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance for the initial (Phase 1) sampling and analysis activities associated with the proposed Resource Conservation and Recovery Act of 1976 (RCRA) clean closure of the 304 Concretion Facility. Over its service life, the 304 Concretion Facility housed the pilot plants associated with cladding uranium cores, was used to

store engineering equipment and product chemicals, was used to treat low-level radioactive mixed waste, recyclable scrap uranium generated during nuclear fuel fabrication, and uranium-titanium alloy chips, and was used for the repackaging of spent halogenated solvents from the nuclear fuels manufacturing process. The strategy for clean closure of the 304 Concretion Facility is to decontaminate, sample (Phase 1 sampling), and evaluate results. If the evaluation indicates that a limited area requires additional decontamination for clean closure, the limited area will be decontaminated, re-sampled (Phase 2 sampling), and the result evaluated. If the evaluation indicates that the constituents of concern are below action levels, the facility will be clean closed. Or, if the evaluation indicates that the constituents of concern are present above action levels, the condition of the facility will be evaluated and appropriate action taken. There are a total of 37 sampling locations comprising 12 concrete core, 1 concrete chip, 9 soil, 11 wipe, and 4 asphalt core sampling locations. Analysis for inorganics and volatile organics will be performed on the concrete core and soil samples. Separate concrete core samples will be required for the inorganic and volatile organic analysis (VOA). Analysis for inorganics only will be performed on the concrete chip, wipe, and asphalt samples.

2159 (WHC-SD-EN-RPT-025) Hanford Site radionuclide national emission standards for hazardous air pollutants unregistered stack (power exhaust) source assessment. Davis, W.E. Westinghouse Hanford Co., Richland, WA (United States). 4 Aug 1994. 75p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017323. Source: OSTI; NTIS; INIS; GPO Dep.

On February 3, 1993, the US Department of Energy, Richland Operations Office received a Compliance Order and Information Request from the Director of the Air and Toxics Division of the US Environmental Protection Agency, Region 10. The Compliance Order requires the Richland Operations Office to evaluate all radionuclide emission points at the Hanford Site to determine which are subject to continuous emission measurement requirements in 40 Code of Federal Regulations (CFR) 61, Subpart H, and to continuously measure radionuclide emissions in accordance with 40 CFR 61.93. This evaluation provides an assessment of the 39 unregistered stacks, under Westinghouse Hanford Company's management, and their potential radionuclide emissions, i.e., emissions with no control devices in place. The evaluation also determined if the effective dose equivalent from any of these stack emissions exceeded 0.1 mrem/yr, which will require the stack to have continuous monitoring. The result of this assessment identified three stacks, 107-N, 296-P-26 and 296-P-28, as having potential emissions that would cause an effective dose equivalent greater than 0.1 mrem/yr. These stacks, as noted by 40 CFR 61.93, would require continuous monitoring.

2160 (WHC-SD-EN-TI-210) Geophysical Investigation of the "Thimble," 100-H Area. Bergstrom, K.A. Westinghouse Hanford Co., Richland, WA (United States). 8 Jul 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015728. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of the geophysical investigations conducted as part of the characterization of the buried "Thimble" site. The site is located just south of the 116-H-2 Crib and is in the 100-HR-2 Operable Unit. Available documentation has it located between, and at the convergence of, two railroad spurs that run north-south. A

concrete monument is believed to mark the site. The burial ground is suspected of containing a vertical safety rod thimble that is reportedly 40 ft long. Ground-penetrating radar (GPR) and electromagnetic induction (EMI) were the two techniques used in the investigation. The methods were selected because they are non-intrusive, relatively fast, economical, and have been used successfully in other similar investigations on the Hanford Site. The objective of the investigation was to locate the buried thimble.

2161 (WHC-SD-EN-TI-213) Geophysical Investigations of French Drain 116-B-9, and Dry Well 116-B-10, 100 B/C Area. Bergstrom, K.A.; Fassett, J.W. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015724. Source: OSTI; NTIS; GPO Dep.

French Drain 116-B-9 and Dry Well 116-B-10 are both located within the 100 B/C-2 Operable Unit, 100 B/C Area (Figure 1). The 116-B-9 French Drain is approximately 4 ft in diameter by 3 ft deep. The exact location or use of the drain is not clear. The 116-B-10 Dry Well is a 3 ft-diameter, tile-lined well on a concrete slab, 7 ft below the surface, overlain by a manhole cover (DOE-RL 1991). The exact location of the well is uncertain. The objective of the survey was to locate the Dry Well and the French Drain. The area to be investigated had several buildings in the area which subsequently have been torn down. Ground penetrating radar (GPR) was the geophysical method chosen for the investigation.

2162 (WHC-SD-EN-TI-217) Geophysical Investigation of burn pit, 128-H-1, 100-H Area. Szwartz, G.J. Westinghouse Hanford Co., Richland, WA (United States). 11 Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015740. Source: OSTI; NTIS; INIS; GPO Dep.

The 128-H-1 burn pit is located in the northeast corner of 100-H Area. The objective of the survey was to delineate subsurface features in the 128-H-1 burn pit that may affect the emplacement of soil-gas probes. Ground-penetrating radar (GPR) and electromagnetic induction (EMI) were the two techniques used in the investigation. The methods were selected because they are non-intrusive, relatively fast, economical, and have been used successfully in other geophysical investigations on the Hanford Site. The GPR system used for this work utilized a 300-MHz antenna to transmit the Em energy into the ground. The transmitted energy is reflected back to a receiving antenna where variations in the return signal are recorded. Common reflectors include natural geologic conditions such as bedding, cementation, moisture, and clay, or man-made objects such as pipes, barrels, foundations, and buried wires. The studied depth, which varies from site to site, was 0-11 ft for this survey. The method is limited in depth by transmit power, receiver sensitivity, and attenuation of the transmitted energy. Depth of investigation is influenced by highly conductive material, such as metal drums, which reflect all the energy back to the receiver. Therefore, the method cannot "see" below such objects.

2163 (WHC-SD-EN-TI-247) Geophysical Investigations in the 100 Areas: Fiscal year 1991 through December 1993. Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-87RL10930. Order Number DE95001573. Source: OSTI; NTIS; INIS; GPO Dep.

The geophysical investigations identified in this document were conducted by the Westinghouse Hanford Company (WHC) Surface Geophysics Team, Geophysics Group, between October, 1991 and December, 1993. The investigations supported 100-Area activities for the Resource Conservation and Recovery Act of 1976 (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). The primary intent of this document is to provide a general map location and the associated document number for investigations that have been conducted as of December, 1993. The results of the individual investigations are not included here. The results of all of these investigations have been previously reported individually in WHC supporting documents. The investigations conducted during Fiscal Year (FY) 1992 are summarized in a single WHC document, WHC-SD-EN-TI-204, Rev. O. A brief summary of some of the successful applications of geophysics in the 100-Areas is included.

2164 (WHC-SD-EN-TI-288) Functional requirements document for measuring emissions of airborne radioactive materials. Criddle, J.D. Jr. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94017998. Source: OSTI; NTIS; INIS; GPO Dep.

This document states the functional requirements and procedures for systems making measurements of radioactive airborne emissions from facilities at the Hanford Site. The following issues are addressed in this document: Definition of the program objectives; Selection of the overall approach to collecting the samples; Sampling equipment design; Sampling equipment maintenance, and quality assurance issues. The intent of this document is to assist WHC in demonstrating a high quality of air emission measurements with verified system performance based on documented system design, testing, inspection, and maintenance.

2165 (WHC-SD-EN-TI-296) Concrete characterization for the 300 Area Solvent Evaporator Closure Site. Prignano, A.L. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008475. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the sampling activities undertaken and the analytical results obtained in a concrete sampling and analyses study performed for the 300 Area Solvent Evaporator (300 ASE) closure site. The 300 ASE is identified as a Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal (TSD) unit that will be closed in accordance with the applicable laws and regulations. No constituents of concern were found in concentrations indicating contamination of the concrete by 300 ASE operations.

2166 (WHC-SD-EN-TP-050) 1995 Study and evaluation of fugitive and diffuse emissions from the 200 East Area at the Hanford Site. Schmidt, J.W.; Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005134. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study is to evaluate Hanford's major diffuse emission sources in the 200 East Area and evaluate the effectiveness of monitoring these sources collectively.

The results from this evaluation may also be utilized to demonstrate Westinghouse's compliance status with the applicable air emissions regulations and determine if additional studies and/or evaluations are necessary. Air sampling will be conducted downwind of the 200 East Area. This site has been chosen as being representative of most large diffuse sources located on the Hanford waste sites. A review of the 1993 ambient air data indicated that ^{137}C was detectable in this area. This study will take place during February to August of 1995. This time period will enable the collection of sufficient data to assess diffuse radionuclide emissions from the 200 East Area waste sites. This study will use existing ambient air monitoring stations supplemented with temporary air monitoring stations. Plots of the 1993 average concentrations of ^{137}Cs and ^{90}Sr collected from the existing stations may be found in Appendix A. Upon completion of this evaluation a recommendation will be made to perform additional sampling studies, or to discontinue further data gathering based on the evaluation's results.

2167 (WHC-SD-F031-PMP-002) Fast Flux Test Facility, Sodium Storage Facility project-specific project management plan. Shank, D.R. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005294. Source: OSTI; NTIS; INIS; GPO Dep.

This Project-Specific Project Management Plan describes the project management methods and controls used by the WHC Projects Department to manage Project 03-F-031. The Sodium Storage Facility provides for storage of the 260,000 gallons of sodium presently in the FFTF Plant. The facility will accept the molten sodium transferred from the FFTF sodium systems, and store the sodium in a solid state under an inert cover gas until such time as a Sodium Reaction Facility is available for final disposal of the sodium.

2168 (WHC-SD-F031-QAPP-001) Project quality assurance plan: Sodium storage facility, project F-031. Shultz, J.W.; Shank, D.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005291. Source: OSTI; NTIS; INIS; GPO Dep.

The Sodium Storage Facility Project Quality Assurance Plan delineates the quality assurance requirements for construction of a new facility, modifications to the sodium storage tanks, and tie-ins to the FFTF Plant. This plan provides direction for the types of verifications necessary to satisfy the functional requirements within the project scope and applicable regulatory requirements determined in the Project Functional Design Criteria (FDC), WHC-SD-FF-FDC-009.

2169 (WHC-SD-FF-CDR-006) Conceptual design report, Sodium Storage Facility, Fast Flux Test Facility, Project F-031. Shank, D.R. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States); Meier Associates, Inc., Kennewick, WA (United States). 14 Feb 1995. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008047. Source: OSTI; NTIS; INIS; GPO Dep.

The Sodium Storage Facility Conceptual Design Report provides conceptual design for construction of a new facility for storage of the 260,000 gallons of sodium presently in the

FFTF plant. The facility will accept the molten sodium transferred from the FFTF sodium systems, and store the sodium in a solid state under an inert cover gas until such time as a Sodium Reaction Facility is available for final disposal of the sodium.

2170 (WHC-SD-FF-DRR-00018) Design review report FFTF interim storage cask. Scott, P.L. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005286. Source: OSTI; NTIS; INIS; GPO Dep.

Final Design Review Report for the FFTF Interim Storage Cask. The Interim Storage Cask (ISC) will be used for long term above ground dry storage of FFTF irradiated fuel in Core Component Containers (CCC)s. The CCC has been designed and will house assemblies that have been sodium washed in the IEM Cell. The Solid Waste Cask (SWC) will transfer a full CCC from the IEM Cell to the RSB Cask Loading Station where the ISC will be located to receive it. Once the loaded ISC has been sealed at the RSB Cask Loading Station, it will be transferred by facility crane to the DSWC Transporter. After the ISC has been transferred to the Interim Storage Area (ISA), which is yet to be designed, a mobile crane will be used to place the ISC in its final storage location.

2171 (WHC-SD-FF-ER-099) Interim storage of sodium in ferritic steel tanks at ambient temperature. Blackburn, L.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001536. Source: OSTI; NTIS; INIS; GPO Dep.

Sodium tanks originally fabricated for elevated temperature service in the Clinch River Breeder Reactor Plant (CRBRP) will be used to store sodium removed from the Fast Flux Test Facility (FFTF) in the Sodium Storage Facility (SSF) at ambient temperature. This report presents an engineering review to confirm that protection against brittle fracture of the ferritic steel tanks is adequate for the intended service.

2172 (WHC-SD-FF-ER-101) FFTF horizontal sodium storage tank preliminary thermal analysis. Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008499. Source: OSTI; NTIS; INIS; GPO Dep.

In the FFTF Shutdown Program, sodium from the primary and secondary heat transport loops, Interim Decay Storage (IDS), and Fuel Storage Facility (FSF) will be transferred to four large storage tanks for temporary storage. Three of the drain tanks will be cylindrical vertical tanks having a diameter of 28 feet, height of 22 feet and fabricated from carbon steel. The vertical tanks were the subject of a previous report and are not the subject of this report. The fourth tank is a horizontal cylindrical tank 18 feet in diameter, having an overall length of 31 feet and fabricated from carbon steel. The purpose of this work is to document the thermal analyses that were performed to ensure that the FFTF horizontal sodium storage tank design is feasible from a thermal standpoint. The key criterion for this analysis is the time to heat up the storage tank containing frozen sodium at ambient temperature to 400 F. Normal operating conditions include an ambient temperature range of 32 F to 120 F. A key parameter in the evaluation of the sodium drain tank is the

type of insulation. The baseline case assumed four inches of calcium silicate insulation. An alternate case assumed refractory fiber (Cerablanket) insulation also with a thickness of four inches. Both cases assumed a total electrical trace heat load of 60 kW, evenly distributed on the tank heads and on the tank side wall (cylinder).

2173 (WHC-SD-FF-ER-102) FFTF vertical sodium storage tank preliminary thermal analysis. Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007782. Source: OSTI; NTIS; INIS; GPO Dep.

In the FFTF Shutdown Program, sodium from the primary and secondary heat transport loops, Interim Decay Storage (IDS), and Fuel Storage Facility (FSF) will be transferred to four large storage tanks for temporary storage. Three of the storage tanks will be cylindrical vertical tanks having a diameter of 28 feet, height of 22 feet and fabricated from carbon steel. The fourth tank is a horizontal cylindrical tank but is not the subject of this report. The storage tanks will be located near the FFTF in the 400 Area and rest on a steel-lined concrete slab in an enclosed building. The purpose of this work is to document the thermal analyses that were performed to ensure that the vertical FFTF sodium storage tank design is feasible from a thermal standpoint. The key criterion for this analysis is the time to heat up the storage tank containing frozen sodium at ambient temperature to 400 F. Normal operating conditions include an ambient temperature range of 32 F to 120 F. A key parameter in the evaluation of the sodium storage tank is the type of insulation. The baseline case assumed six inches of calcium silicate insulation. An alternate case assumed refractory fiber (Cerablanket) insulation also with a thickness of six inches. Both cases assumed a total electrical trace heat load of 60 kW, with 24 kW evenly distributed on the bottom head and 36 kW evenly distributed on the tank side wall.

2174 (WHC-SD-FF-OMM-010) G-3, Turbine enclosure halon system. Contini, M.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003064. Source: OSTI; NTIS; GPO Dep.

This document provides the manufacturer operating and maintenance instructions for the PFC 2000RC Fire Detection and Suppression Panel and its supporting components known as C1408.

2175 (WHC-SD-FF-PSE-002) Preliminary safety evaluation (PSE) for Sodium Storage Facility at the Fast Flux Test Facility. Bowman, B.R. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001541. Source: OSTI; NTIS; INIS; GPO Dep.

This evaluation was performed for the Sodium Storage Facility (SSF) which will be constructed at the Fast Flux Test Facility (FFTF) in the area adjacent to the South and West Dump Heat Exchanger (DHX) pits. The purpose of the facility is to allow unloading the sodium from the FFTF plant tanks and piping. The significant conclusion of this Preliminary Safety Evaluation (PSE) is that the only Safety Class 2 components are the four sodium storage tanks and their foundations. The building, because of its imminent risk to the tanks under an earthquake or high winds, will be Safety Class 3/2, which means the building has a Safety Class 3

function with the Safety Class 2 loads of seismic and wind factored into the design.

2176 (WHC-SD-FF-SSP-004-Rev.1) **Fast flux test facility, transition project plan.** Guttenberg, S. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 277p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003860. Source: OSTI; NTIS; INIS; GPO Dep.

The FFTF Transition Project Plan, Revision 1, provides changes and project baseline for the deactivation activities necessary to transition the FFTF to a radiologically and industrially safe shutdown condition.

2177 (WHC-SD-FF-SSP-050-Rev.1) **Fast Flux Test Facility transition project resource loaded schedule: Revision 1.** Hulvey, R.K. Westinghouse Hanford Co., Richland, WA (United States). 31 Oct 1994. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002961. Source: OSTI; NTIS; INIS; GPO Dep.

Revision 1 of the Fast Flux Test Facility (FFTF) Transition Project Resource Loaded Schedule (RLS) provides detail to manage the major elements, project baseline and cost estimate for the FFTF Transition Project within the Advanced Reactors Transition Program, comprised of Activity Data Sheets (ADS) 6640, 6641, and 6642. The scope includes all work in the Budget and Reporting categories of Program Integration (PI), Surveillance and Maintenance (S and M), and Deactivation/Compliance (D/C). The transition activities are necessary to bring the FFTF and related facilities to a safe deactivation state, while maintaining worker health and safety. The scope of ADS 6640 and 6642 is the FFTF Transition Project while the scope of ADS 6641 is the Hanford Site Nuclear Energy Legacies.

2178 (WHC-SD-FF-SSP-052) **Advanced reactors transition fiscal year 1995 multi-year program plan WBS 7.3.** Lolka, E.F. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1994. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001565. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes in detail the work to be accomplished in FY-1995 and the out years for the Advanced Reactors Transition (WBS 7.3). This document describes specific milestones and funding profiles. Based upon the Fiscal Year 1995 Multi-Year Program Plan, DOE will provide authorization to perform the work outlined in the FY 1995 MYPP. Following direction given by the US Department of Energy (DOE) on December 15, 1993, Advanced Reactors Transition (ART), previously known as Advanced Reactors, will provide the planning and perform the necessary activities for placing the Fast Flux Test Facility (FFTF) in a radiologically and industrially safe shutdown condition. The DOE goal is to accomplish the shutdown in approximately five years. The Advanced Reactors Transition Multi-Year Program Plan, and the supporting documents; i.e., the FFTF Shutdown Program Plan and the FFTF Shutdown Project Resource Loaded Schedule (RLS), are defined for the life of the Program. During the transition period to achieve the Shutdown end-state, the facilities and systems will continue to be maintained in a safe and environmentally sound condition. Additionally, facilities that were associated with the Office of Nuclear Energy (NE) Programs, and are no longer required to support the Liquid Metal Reactor Program will be deactivated and transferred to an alternate sponsor or the

Decontamination and Decommissioning (D and D) Program for final disposition, as appropriate.

2179 (WHC-SD-FF-TA-034) **Shielding analysis of the IEM cell offset adapter plate.** Simons, R.L. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006848. Source: OSTI; NTIS; INIS; GPO Dep.

The adapter plate for the Interim Examination and Maintenance (IEM) cell ten foot ceiling valve was modified so that the penetration through the valve is offset to the north side of the steel plate. The modifications required that the shielding effectiveness be evaluated for several operating conditions. The highest gamma ray dose rate (51 mrem/hr) occurs when a Core Component Container (CCC) with six high burn-up driver fuel assemblies is transferred into or out of Solid Waste Cask (SWC). The neutron dose rate at the same source location is 2.5 mrem/hr. The total dose rate during the transfer is less than the 200 mrem/hr limit. If the ten foot ceiling valve is closed, the dose rate with twelve DFA in the cell will be less than 0.1 mrem/hr. However, with the ceiling valve open the dose rate will be as high as 12 mrem/hr. The latter condition will require controlled access to the area around the offset adapter plate when the ceiling valve is open. It was found that gaps in the shield block around the SWC floor valve will allow contact dose rates as high as 350 mrem/hr during the transfer of a fully loaded CCC. Although this situation does not pertain to the offset adapter plate, it will require controlled access around the SWC valve during the transfer of a fully loaded CCC.

2180 (WHC-SD-GN-CSWD-30036-Rev.1) **SASSI system software configuration.** Weiner, E.O. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002141. Source: OSTI; NTIS; GPO Dep.

The SASSI (System for Analysis for Soil-Structure Interaction) computer program was obtained by WHC from the University of California at Berkeley for seismic structural analysis of complex embedded building configurations. SASSI was developed in the 1980's by a team of doctoral students under the direction of Prof. J. Lysmer. The program treats three-dimensional soil-structure interaction problems with the flexible volume substructuring method. In the 1970's, the same organization developed the FLUSH program, which has achieved widespread international usage in the seismic analysis of structures. SASSI consists of nine modules, each of which are to be run as a separate execution. The SASSI source code, dated 1989 and identified as a Cray version, was put up on the RL Cray XM/232 Unicos system in 1991. That system was removed at the end of 1993, and SASSI is now installed on the LANL Cray YMP systems.

2181 (WHC-SD-GN-DGS-30011) **Radiological design guide.** Evans, R.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Aug 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001566. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this design guide is to provide radiological safety requirements, standards, and information necessary for designing facilities that will operate without unacceptable risk to personnel, the public, or the environment as required by the US Department of Energy (DOE). This design guide,

together with WHC-CM-4-29, Nuclear Criticality Safety, WHC-CM-4-46, Nonreactor Facility Safety Analysis, and WHC-CM-7-5, Environmental Compliance, covers the radiation safety design requirements at Westinghouse Hanford Company (WHC). This design guide applies to the design of all new facilities. The WHC organization with line responsibility for design shall determine to what extent this design guide shall apply to the modifications to existing facilities. In making this determination, consideration shall include a cost versus benefit study. Specifically, facilities that store, handle, or process radioactive materials will be covered. This design guide replaces WHC-CM-4-9 and is designated a living document. This design guide is intended for design purposes only. Design criteria are different from operational criteria and often more stringent. Criteria that might be acceptable for operations might not be adequate for design.

2182 (WHC-SD-GN-ER-30034) Photos of deficiencies found during roof inspection. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005162. Source: OSTI; NTIS; INIS; GPO Dep.

This report shows photos of roof deficiencies noted during roof inspections conducted since 1992 at the Hanford Site.

2183 (WHC-SD-GN-ICD-20001) Interface agreement for the management of FFTF Spent Nuclear Fuel. McCormack, R.L. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007181. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Spent Nuclear Fuel (SNF) Project was formed to manage the SNF at Hanford. The mission of the Fast Flux Test Facility (FFTF) Transition Project is to place the facility in a radiologically and industrially safe shutdown condition for turnover to the Environmental Restoration Contractor (ERC) for subsequent D&D. To satisfy both project missions, FFTF SNF must be removed from the FFTF and subsequently dispositioned. This document provides the interface agreement between FFTF Transition Project and SNF Project for management of the FFTF SNF.

2184 (WHC-SD-GN-QAPP-001-Rev.1) Quality assurance program plan for the Site Physical and Electrical Calibration Services Lab. Revision 1. Carpenter, C.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008466. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan (QAPP) is organized to address WHC's implementation of quality assurance requirements as they are presented as interpretive guidance endorsed by the Department of Energy (DOE) Field Office, Richland DOE Order 5700.6C Quality Assurance. The quality assurance requirements presented in this plan will assure Measuring and Test Equipment (M and TE) are in conformance with prescribed technical requirements and that data provided by testing, inspection, or maintenance are valid. This QAPP covers all activities and work elements that are variously called QA, quality control, and quality engineering regardless of the organization performing the work. This QAPP identifies the QA requirements for planning, control, and documentation of operations, modifications, and maintenance of the WHC Site Physical and

Electrical Calibration Services Laboratory. The primary function of the WHC Site Physical and Electrical Calibration Services Laboratory is providing calibration, standardization, or repair service of M and TE.

2185 (WHC-SD-GN-SDD-30007-Rev.1) CDMS: CAD data set system design description: Revision 1. Gray, E.L. Westinghouse Hanford Co., Richland, WA (United States). 25 Oct 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003218. Source: OSTI; NTIS; INIS; GPO Dep.

This document is intended to formalize the program design of the CAD Data Set Management System (CDMS) and to be the vehicle to communicate the design to the Engineering, Design Services, and Configuration Management organizations and the WHC IRM Analysts/Programmers. The SDD shows how the software system will be structured to satisfy the requirements identified in the WHC-SD-GN-CSRS-30005 CDMS Software Requirement Specification (SRS). It is a description of the software structure, software components, interfaces, and data that make up the CDMS System. The design descriptions contained within this document will describe in detail the software product that will be developed to assist the aforementioned organizations for the express purpose of managing CAD data sets associated with released drawings, replacing the existing locally developed system and laying the foundation for automating the configuration management.

2186 (WHC-SD-GN-TRP-20014) Load test of the 283W Clearwell Roof Deck and Support Structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003865. Source: OSTI; NTIS; GPO Dep.

The 283W Clearwell roof area was load tested according to the approved load-test procedure, WHC-SD-GN-TP-30015, Revision 0, as modified below. The 283W Clearwell is located in the 200 West Area of the Hanford Site and has the following characteristics: Roof deck - concrete slab supported by columns and walls; Roof membrane - tar and gravel; Roof slope - flat (< 10 deg); and Roof elevation - approximately 6 in. above ground level. The 283W Clearwell was visited in April 1993 for a visual inspection, but could not be inspected because of the confined space requirements. It was revisited in February 1994 for the purpose of writing this test report. Because the roof could not be inspected, a test was determined to be the best way to qualify the roof for personnel access.

2187 (WHC-SD-GN-TRP-20024) Load test of the 272E Building high bay roof deck and support structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003073. Source: OSTI; NTIS; INIS; GPO Dep.

The 272E Building high bay roof area was load tested according to the approved load-test procedure. The 272E Building is located in the 200 East Area of the Hanford Site and has the following characteristics: Roof deck - wood decking supported by 4 x 14 timber purlins; Roof membrane - tar and gravel; Roof slope - flat (<10 deg); and Roof elevation - maximum height of about 63 ft. The 272 Building was visited in August 1992 for a visual inspection. During

this inspection, cracked areas were visible in the decking, but it was not possible to determine whether these cracks extended completely through the decking, which is 2-in. thick. The building was revisited in March 1994 for the purpose of writing this test report. Because the roof requires personnel access, a test was determined to be the best way to qualify the roof. The pre-test briefing consisted of filling out the pre-test checklist, discussing proper lifting techniques, reviewing the fall-protection plan, reviewing the job hazards analysis, and reviewing the robot travel path. The load-test results consist of visual observations and the test engineer's conclusions. Visual observations found no adverse conditions such as large deflections or permanent deformations. No deflection measurements were recorded because the tar and gravel on roof get displaced by the robot tracks; the result is large variations in deflection measurements. The conclusions are that the roof has been qualified for 500-lb total roof load and that the "No Roof Access" signs can be changed to "Roof Access Restricted" signs.

2188 (WHC-SD-GN-TRP-20025) Load test of the 272W Building high bay roof deck and support structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003859. Source: OSTI; NTIS; INIS; GPO Dep.

This reports the results of the Load Test of the 272W Building High Bay Roof Deck and Support Structure.

2189 (WHC-SD-GN-TRP-20026) Load test of the 277W Building high bay roof deck and support structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 2 Dec 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004492. Source: OSTI; NTIS; INIS; GPO Dep.

The 277W Building high bay roof area was load tested according to the approved load-test procedure, WHC-SD-GN-TP-30015, Revision 1. The 277W Building is located in the 200 West Area of the Hanford Site and has the following characteristics: roof deck – wood decking supported by 4 x 14 timber purlins; roof membrane – tar and gravel; roof slope – flat (<10 deg); and roof elevation – maximum height of about 63 ft. The 277W Building was visited in March 1994 for a visual inspection. During this inspection, cracked areas were visible in the decking, but it was not possible to determine whether these cracks extended completely through the decking, which is 2-in. thick. The building was revisited in March 1994 for the purpose of writing this test report. Because the roof requires personnel access, a test was determined to be the best way to qualify the roof. The conclusions are that the roof has been qualified for 500-lb total roof load and that the "No Roof Access" signs can be changed to "Roof Access Restricted" signs.

2190 (WHC-SD-GN-TRP-30010) Load test of the 3701U Building roof deck and support structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000434. Source: OSTI; NTIS; INIS; GPO Dep.

The 3701U Building roof area was load tested according to the approved load-test procedure. The 3701U Building is located in the 300 Area of the Hanford Site and has the following characteristics: Roof deck–metal decking supported

by steel purlins; Roof membrane–tar and gravel; Roof slope–flat (<10 deg); and Roof elevation–height of about 12.5 ft. The 3701U Building was visited in August 1992 for a visual inspection, but because of insulation an inspection could not be performed. The building was revisited in March 1994 for the purpose of writing this test report. Because the roof could not be inspected, a test was determined to be the best way to qualify the roof for personnel access. The test procedure called for the use of a remotely-controlled robot. The conclusions are that the roof has been qualified for 500-lb total roof load and that the "No Roof Access" signs can be changed to "Roof Access Restricted" signs.

2191 (WHC-SD-GN-TRP-30011) Load test of the 3701D Building roof deck and support structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 16 Sep 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001041. Source: OSTI; NTIS; INIS; GPO Dep.

This reports the results of the load test of the 3701D Building roof deck and support structure.

2192 (WHC-SD-GN-TRP-30018) Load test of the 3790 Building Roof Deck and Support Structure. McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001538. Source: OSTI; NTIS; INIS; GPO Dep.

This reports the results of the load test of the 3790 building roof deck and support structure.

2193 (WHC-SD-L097-ATP-005) Project 93L-EWL-097, fire alarm system improvements, 300 Area. Scott, M.V. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005608. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the Acceptance Test Procedure (ATP) which will demonstrate that the modifications to the Fire Protection systems in the 338 Building function as intended. The ATP will test the fire alarm control panel, flow alarm pressure switch, post indicator valve tamper switch, heat detectors, flow switches, and fire alarm signaling devices.

2194 (WHC-SD-L205-ATP-001) Fire alarm system. Koehling, E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005607. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure is the documentation for the testing of the 4 fire alarm bells which rewired during the remodeling of the Emergency Operations Center in the Richland, Washington, Federal Office Building.

2195 (WHC-SD-L225-ATP-001) Acceptance test procedure for the MO-294 Building. McKenna, P.J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004786. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides the Acceptance Test Procedure (ATP) for the acceptance and testing of the fire alarm system of mobile office MO-294.

2196 (WHC-SD-LL-ATR-020) Acceptance Test Procedure for Project 251W, WBS 3, Substation A-8, Building 251-W, Bus #2 switchgear replacement. VanBaalen, R.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 224p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006832. Source: OSTI; NTIS; INIS; GPO Dep.

This document records the steps taken and results of the acceptance testing of the new 13.8kV switchgear installed at 251W. This gear is under the administrative control of Electrical Utilities.

2197 (WHC-SD-LL-ES-040) 300 Area signal cable study. Whattam, J.W. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000431. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared to discuss the alternatives available for removing the 300 Area overhead signal cable system. This system, installed in 1969, has been used for various monitoring and communication signaling needs throughout the 300 Area. Over the years this cabling system has deteriorated, has been continually reconfigured, and has been poorly documented to the point of nonreliability. The first step was to look at the systems utilizing the overhead signal cable that are still required for operation. Of the ten systems that once operated via the signal cable, only five are still required; the civil defense evacuation alarms, the public address (PA) system, the criticality alarms, the Pacific Northwest Laboratory Facilities Management Control System (FMCS), and the 384 annunciator panel. Of these five, the criticality alarms and the FMCS have been dealt with under other proposals. Therefore, this study focused on the alternatives available for the remaining three systems (evacuation alarms, PA system, and 384 panel) plus the accountability aid phones. Once the systems to be discussed were determined, then three alternatives for providing the signaling pathway were examined for each system: (1) rewire using underground communication ducts, (2) use the Integrated Voice/Data Telecommunications System (IVDTS) already installed and operated by US West, and (3) use radio control. Each alternative was developed with an estimated cost, advantages, and disadvantages. Finally, a recommendation was provided for the best alternative for each system.

2198 (WHC-SD-PRP-HA-001-Rev.2) UO₃ Plant hazards assessment. Revision 2. Campbell, L.R. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006850. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the hazards assessment for the UO₃ Facility located on the US Department of Energy (DOE) Hanford Site. Decontamination and RCRA closure activities at the UO₃ facility are the responsibility of Bechtel Hanford Incorporated (BHI) under contract to the DOE. There is a substantial inventory of uranium tri-oxide powder temporarily stored on the U-Plant site. This material is the responsibility of Westinghouse Hanford Company (WHC) under contract to the DOE. The uranium tri-oxide powder storage is the subject of a separate hazards assessment. This hazards assessment was conducted to assess the need for emergency planning at the UO₃ facility. DOE Order 5500.3A requires an emergency planning hazards assessment for each facility to determine the appropriate scope of emergency planning and

provide the technical basis for the planning. Detailed descriptions of the UO₃ Facility and the Hanford Site are found in section 3 and sections 4 through 7, respectively, of the Safety Analysis Report (SAR) for the UO₃ plant. The SAR will not be maintained with the plant deactivated.

2199 (WHC-SD-PRP-HA-007) Liquid Effluent Retention Facility/Effluent Treatment Facility Hazards Assessment. Simiele, G.A. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001582. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning activities for the Liquid Effluent Retention Facility and Effluent Treatment Facility the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE ORDER 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

2200 (WHC-SD-PRP-HA-008) B Plant hazards assessment. Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001042. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning Activities for B Plant on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE Order 5500.3A. Through this document, the technical basis for the development of facility specific , Emergency Action Levels and the Emergency Planning Zone is demonstrated.

2201 (WHC-SD-PRP-HA-010) Solid Waste Burial Grounds/Central Waste Complex hazards assessment. Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001596. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning Activities for Solid Waste Burial Grounds/Central Waste Complex on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE Order 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is documented.

2202 (WHC-SD-PRP-HA-011) PUREX facility hazards assessment. Sutton, L.N. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001003. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the hazards assessment for the Plutonium Uranium Extraction Plant (PUREX) located on the US Department of Energy (DOE) Hanford Site. Operation of PUREX is the responsibility of Westinghouse Hanford Company (WHC). This hazards assessment was conducted to provide the emergency planning technical basis for PUREX. DOE Order 5500.3A requires an emergency planning hazards assessment for each facility that has the potential to reach or exceed the lowest level emergency classification. In October of 1990, WHC was directed to place PUREX in

standby. In December of 1992 the DOE Assistant Secretary for Environmental Restoration and Waste Management authorized the termination of PUREX and directed DOE-RL to proceed with shutdown planning and terminal clean out activities. Prior to this action, its mission was to reprocess irradiated fuels for the recovery of uranium and plutonium. The present mission is to establish a passively safe and environmentally secure configuration at the PUREX facility and to preserve that condition for 10 years. The ten year time frame represents the typical duration expended to define, authorize and initiate follow-on decommissioning and decontamination activities.

2203 (WHC-SD-PRP-HA-012) 283-E and 283-W hazards assessment. Sutton, L.N. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001043. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the hazards assessment for the 200 area water treatment plants 283-E and 283-W located on the US DOE Hanford Site. Operation of the water treatment plants is the responsibility of ICF Kaiser Hanford Company (ICF KH). This hazards assessment was conducted to provide emergency planning technical basis for the water treatment plants. This document represents an acceptable interpretation of the implementing guidance document for DOE ORDER 5500.3A which requires an emergency planning hazards assessment for each facility that has the potential to reach or exceed the lowest level emergency classification.

2204 (WHC-SD-PRP-HA-013) Tank farms hazards assessment. Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001581. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford contractors are writing new facility specific emergency procedures in response to new and revised US Department of Energy (DOE) Orders on emergency preparedness. Emergency procedures are required for each Hanford facility that has the potential to exceed the criteria for the lowest level emergency, an Alert. The set includes: (1) a facility specific procedure on Recognition and Classification of Emergencies, (2) area procedures on Initial Emergency Response and, (3) an area procedure on Protective Action Guidance. The first steps in developing these procedures are to identify the hazards at each facility, identify the conditions that could release the hazardous material, and calculate the consequences of the releases. These steps are called a Hazards Assessment. The final product is a document that is similar in some respects to a Safety Analysis Report (SAR). The document could be produced in a month for a simple facility but could take much longer for a complex facility. Hanford has both types of facilities. A strategy has been adopted to permit completion of the first version of the new emergency procedures before all the facility hazards Assessments are complete. The procedures will initially be based on input from a task group for each facility. This strategy will but improved emergency procedures in place sooner and therefore enhance Hanford emergency preparedness. The purpose of this document is to summarize the applicable information contained within the Waste Tank Facility "Interim Safety Basis Document, WHC-SD-WM-ISB-001" as a resource, since the SARs covering Waste Tank Operations are not current in all cases. This

hazards assessment serves to collect, organize, document and present the information utilized during the determination process.

2205 (WHC-SD-PRP-HA-014) T Plant hazards assessment. Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004756. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning activities for the T Plant on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE ORDER 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

2206 (WHC-SD-PRP-HA-015) Fast flux test facility hazards assessment. Sutton, L.N. Westinghouse Hanford Co., Richland, WA (United States). 24 Oct 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004107. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning Activities for the Fast Flux Test Facility on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE Order 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

2207 (WHC-SD-PRP-HA-016) Emergency response environmental sampling plan. Broz, R.E. Westinghouse Savannah River Co., Aiken, SC (United States). 31 Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001594. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning Activities for post Hanford hazardous releases on the Hanford Site. This document supports EPA-400 requirements.

2208 (WHC-SD-PRP-HA-017) 233-S plutonium concentration facility hazards assessment. Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 19 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005649. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning activities for the 233-S Plutonium Concentration Facility on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE ORDER 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

2209 (WHC-SD-RE-SEL-001-Rev.2) Purex plant safety equipment list for deactivation. Revision 2. Walser, R.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004484. Source: OSTI; NTIS; GPO Dep.

This document provides a list of equipment and/or systems essential to the continuing safety of the PUREX facility

during DEACTIVATION. The basis for the safety equipment list (SEL) is provided in WHC-SD-RD-022 Rev 1. Equipment selection is based on WHC-CM-1-3, MRP 5.46 as implemented by WHC-CM-4-46, Section 9.0. Format: The safety equipment list is divided into two sections: (1) Process Equipment and (2) Process Instrumentation. Only section (1) is included in this document.

2210 (WHC-SD-RTG-WP-001) Work plan for the fabrication of the radioisotope thermoelectric generator transportation system package mounting. Satoh, J.A. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004152. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioisotope Thermoelectric Generator (RTG) has available a dedicated system for the transportation of RTG payloads. The RTG Transportation System (System 100) is comprised of four systems; the Package (System 120), the Semi-trailer (System 140), the Gas Management (System 160), and the Facility Transport (System 180). This document provides guidelines on the fabrication, technical requirements, and quality assurance of the Package Mounting (Subsystem 145), part of System 140. The description follows the Development Control Requirements of WHC-CM-6-1, EP 2.4, Rev. 3.

2211 (WHC-SD-SNF-ATP-006) Acceptance test procedure for the MO-293 (1722) 10-wide mobile office. Wallace, S.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006791. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure has been prepared to demonstrate that the Fire Protection System functions as required by project criteria. The test results will be issued as an acceptance test report after all the testing is complete. This facility is part of the Spent Nuclear Fuel Project. An appendix is provided as a checklist of activities to be performed by the fire alarm system installer to ensure proper installation and operation.

2212 (WHC-SD-SNF-ATR-003) MAC Version 3.1, MBA Version 1.2 acceptance test summary report. Russell, V.K. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002152. Source: OSTI; NTIS; INIS; GPO Dep.

This reference discusses the development of software designed to collect data from the K Basins Materials Accountability and Materials Balance programs. Problems with the software were encountered and worked out. Encompassed in this report are descriptors of the results of the test and signoff sheets associated with the testing.

2213 (WHC-SD-SNF-CM-002) Configuration Management Plan for K Basins. Weir, W.R.; Laney, T. Westinghouse Hanford Co., Richland, WA (United States). 27 Jan 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007189. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes a configuration management program for K Basins that establishes the systems, processes, and responsibilities necessary for implementation. The K Basins configuration management plan provides the methodology

to establish, upgrade, reconstitute, and maintain the technical consistency among the requirements, physical configuration, and documentation. The technical consistency afforded by this plan ensures accurate technical information necessary to achieve the mission objectives that provide for the safe, economic, and environmentally sound management of K Basins and the stored material. The configuration management program architecture presented in this plan is based on the functional model established in the DOE Standard, DOE-STD-1073-93, "Guide for Operational Configuration Management Program".

2214 (WHC-SD-SNF-CMD-001) Configuration management compliance matrix for K Basins. Laney, T. Westinghouse Hanford Co., Richland, WA (United States). 16 Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009151. Source: OSTI; NTIS; INIS; GPO Dep.

This compliance matrix identifies the criteria of the configuration management program at K Basins and identifies the current methods, i.e., systems, processes, procedures, and programs, that implement the configuration management criteria. The matrix identifies the current K Basins implementing methods established through an initial assessment. This initial assessment of the implementation is reflected in the compliance matrix and forms the basis for subsequent detailed evaluations to ensure that the identified implementation methods adequately support the configuration management program. Specific objectives of this matrix include: Identifying functional elements (criteria) of configuration management and K Basins implementation of these criteria; Assessing the conformance of the implementation and providing resolution for discrepancies; Recommending corrective actions or improvements for discrepant conditions; Providing a tracking database to status the discrepancy resolutions; and Identifying estimated schedules and resources for implementing discrepancy resolutions.

2215 (WHC-SD-SNF-CR-001) Design criteria document, electrical system, K-Basin essential systems recovery, Project W-405. Hoyle, J.R. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005217. Source: OSTI; NTIS; INIS; GPO Dep.

This Design Criteria Document provides the criteria for design and construction of electrical system modifications for 100K Area that are essential to protect the safe operation and storage of spent nuclear fuel in the K-Basin facilities.

2216 (WHC-SD-SNF-CR-002) Design criteria document, Maintenance Shop/Support Facility, K-Basin Essential Systems Recovery, Project W-405. Strehlow, M.W.B. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005136. Source: OSTI; NTIS; INIS; GPO Dep.

During the next 10 years a substantial amount of work is scheduled in the K-Basin Area related to the storage and eventual removal of irradiated N-Reactor fuel. Currently, maintenance support activities are housed in existing structures that were constructed in the early 1950's. These forty-year-old facilities and their supporting services are substandard, leading to inefficiencies. Because of numerous identified deficiencies and the planned increase in the numbers of K-Basin maintenance personnel, adequate

maintenance support facilities that allow efficient operations are needed. The objective of this sub-project of Project W-405 is to provide a maintenance and storage facility which meets the K-Basin Maintenance Organization requirements as defined in Attachment 1. In Reference A, existing guidelines and requirements were used to allocate space for the maintenance activities and to provide a layout concept (See Attachment 2). The design solution includes modifying the existing 190 K-E building to provide space for shops, storage, and administration support functions. The primary reason for the modification is to simplify siting/permitting and make use of existing infrastructure. In addition, benefits relative to design loads will be realized by having the structure inside 190K-E. The new facility will meet the Maintenance Organization approved requirements in Attachment 1 relating to maintenance activities, storage areas, and personnel support services. This sub-project will also resolve outstanding findings and/or deficiencies relating to building fire protection, HVAC requirements, lighting replacement/upgrades, and personnel facilities. Compliance with building codes, local labor agreements and safety standards will result.

2217 (WHC-SD-SNF-CSE-001) Basis for category B designation for K basins. Jensen, M.A. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001307. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document analyzes the various fissile material configurations in the 105-K East and K West fuel storage basins to determine the proper firefighting category. Firefighting categories are assigned to fissionable material facilities to provide guidance to firefighters in the allowable uses of water and other extinguishing materials to prevent inadvertent rearrangement of fissile materials or addition of neutron moderators which could lead to a criticality. This document concludes the appropriate category is B, which does not impose any restrictions on the use of water for firefighting purposes.

2218 (WHC-SD-SNF-CSE-002) Criticality safety evaluation report for K Basin filter cartridges. Schwinkendorf, K.N. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004495. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety evaluation of the K Basin filter cartridge assemblies has been completed to support operations without a criticality alarm system. The results show that for normal operation, the filter cartridge assembly is far below the safety limit of $k_{eff} = 0.95$, which is applied to plutonium systems at the Hanford Site. During normal operating conditions, uranium, plutonium, and fission and corrosion products in solution are continually accumulating in the available void spaces inside the filter cartridge medium. Currently, filter cartridge assemblies are scheduled to be replaced at six month intervals in KE Basin, and at one year intervals in KW Basin. According to available plutonium concentration data for KE Basin and data for the U/Pu ratio, it will take many times the six-month replacement time for sufficient fissionable material accumulation to take place to exceed the safety limit of $k_{eff} = 0.95$, especially given the conservative assumption that the presence of fission and corrosion products is ignored. Accumulation of sludge with a composition typical of that measured in the sand filter backwash pit will not lead to a $k_{eff} = 0.95$ value. For off-normal

scenarios, it would require at least two unlikely, independent, and concurrent events to take place before the $k_{eff} = 0.95$ limit was exceeded. Contingencies considered include failure to replace the filter cartridge assemblies at the scheduled time resulting in additional buildup of fissionable material, the loss of geometry control from the filter cartridge assembly breaking apart and releasing the individual filter cartridges into an optimal configuration, and concentrations of plutonium at U/Pu ratios less than measured data for KE Basin, typically close to 400 according to extensive measurements in the sand filter backwash pit and plutonium production information.

2219 (WHC-SD-SNF-DA-009) Resolution of Surveillance Report No. PAD-BDW-95-004 for suspect bolts installed in the 105 KW roof addition structure. Frier, W.A. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Advent Engineering Services, Inc., San Ramon, CA (United States). 14 Apr 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010593. Source: OSTI; NTIS; INIS; GPO Dep.

A DOE RL surveillance determined that a test report (WHC-SD-NR-TRP-020) was less than adequate. As a result, WHC removed nine of the previous in-situ tested A325 suspect bolts and contracted with Koon-Hall Testing Corporation to perform hardness and tensile testing and chemical composition analysis of the removed bolts. WHC also contracted with ADVENT Engineering, Inc., to perform an evaluation of the Koon-Hall test results and to respond to the concerns identified in the DOE RL surveillance. The Koon-Hall Laboratory test results and the assessments strongly support the conclusion that the suspect bolts are indeed the equivalent of A325 high-strength, Type-1 bolts and have been properly heat-treated.

2220 (WHC-SD-SNF-DRR-002-Vol.1) Design review report for the 105 K-East Basin dose reduction concept. Volume 1. Dearing, J.I. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010134. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological surveys in the 105 K-East Fuel Storage Basin show average dose rates of 4 to 50 mrem/hr. A major source of the dose is the radionuclides that have been absorbed into the concrete wall of the basin. This reports documents the design review of the concept for reducing the dose from the walls. Volume 1 comprises the Design Review Report and Volume 2 comprises the Design Review Package.

2221 (WHC-SD-SNF-DRR-002-Vol.2) Design Review Report for the 105 K-East Basin dose reduction concept, Volume 2, Review Package. Dearing, J.I. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 379p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010133. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological surveys in the 105 K-East Fuel Storage Basin show average dose rates of 4 to 50 mrem/hr. A major source of the dose is the radionuclides that have been absorbed into the concrete wall of the basin. This report documents the design review of the concept for reducing the dose from the walls. Volume 1 comprises Design Review Report and Volume 2 comprises the Design Review Package.

2222 (WHC-SD-SNF-EDL-001) Interim essential and support drawing list for K Basins. Langevin, M.J. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005643. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a list of essential and support drawings that have been identified as required to achieve the mission objectives of K Basin and are an integral part of the in-progress K Basins system baselining effort. The drawings listed in the appendix are those drawings required to safely operate K Basins. These drawings will be authenticated through the field verification and design reconstitution programs to ensure that these identified drawings are consistent with design requirements.

2223 (WHC-SD-SNF-ER-004) Corrosion evaluation of fuel canister crusher rigging. Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). 2 Nov 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002962. Source: OSTI; NTIS; INIS; GPO Dep.

A fuel canister crusher with attached rigging is located in the 105 K-East Basin discharge chute. This equipment is slated to be moved as part of seismic mitigation to prevent a major basin leak through a construction joint located in the base of the chute. This corrosion analysis assessed the load-bearing ability of the rigging, which consists of shackles and thimble-spliced wire rope. The K-East Basin demineralized water results in corrosion rates of <2 mil/year (<0.05 mm/year) for carbon, low-alloy carbon, and stainless steels. The galvanized carbon steel shackles (with low-alloy steel anchor pins) have experienced negligible corrosion and are judged to be mechanically unaffected by their water exposure. The carbon steel wire rope and stainless steel thimbles have undergone minimal corrosion. Due to the small amount of corrosion products (as seen from video inspection), the absence of wire breakage, and a Factor of Safety calculation, it is judged that the wire rope and thimbles would withstand the proposed relocation activities.

2224 (WHC-SD-SNF-FVP-001) K Basins Field Verification Program. Booth, H.W. Westinghouse Hanford Co., Richland, WA (United States). 2 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004366. Source: OSTI; NTIS; INIS; GPO Dep.

The Field Verification Program establishes a uniform and systematic process to ensure that technical information depicted on selected engineering drawings accurately reflects the actual existing physical configuration. This document defines the Field Verification Program necessary to perform the field walkdown and inspection process that identifies the physical configuration of the systems required to support the mission objectives of K Basins. This program is intended to provide an accurate accounting of the actual field configuration by documenting the as-found information on a controlled drawing.

2225 (WHC-SD-SNF-FVP-002) Engineering assessment of 105 K basin monorails. Frier, W.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 335p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010040. Source: OSTI; NTIS; INIS; GPO Dep.

The engineering assessment of the 105 K Basins monorails was performed to provide the engineering analysis to

justify the existing basin north-south monorail capacity. The existing monorails have a capacity of 2400 lbs posted on the north-south monorails. The engineering assessment concluded that the monorail, hanger system, and trolleys all rate for a 2000 lb capacity. Based upon a 2,500 lb trolley load, the monorails, the hanger system, and the double trolley hoist system will rate for 2,500 lbs. The single trolley hoist system for handling the fuel canisters and the trolley systems used in the various transfer areas are limited by manufacturers to 2,000 lbs. Therefore, it is concluded from this engineering assessment that the 2,400 lb capacity posting for the north-south basin monorails is appropriate.

2226 (WHC-SD-SNF-LB-001) Radon discrimination for work place air samples. Bratvold, T. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001649. Source: OSTI; NTIS; INIS; GPO Dep.

Gross alpha/beta measurement systems are designed solely to identify an incident particle as either an alpha or a beta and register a count accordingly. The tool of choice for radon identification, via decay daughters, is an instrument capable of identifying the energy of incident alpha particles and storing that information separately from detected alpha emissions of different energy. In simpler terms, the desired instrument is an alpha spectroscopy system. K Basins Radiological Control (KBRC) procured an EG&G ORTEC OCTETE PC alpha spectroscopy system to facilitate radon identification on work place air samples. The alpha spectrometer allows for the identification of any alpha emitting isotope based on characteristic alpha emission energies. With this new capability, KBRC will explicitly know whether or not there exists a true airborne concern. Based on historical air quality data, this new information venue will reduce the use of respirators substantially. Situations where an area remains "on mask" due solely to the presence of radon daughters on the grab air filter will finally be eliminated. This document serves to introduce a new method for radon daughter detection at the 183KE Health Physics Analytical Laboratory (HPAL). A new work place air sampling analysis program will be described throughout this paper. There is no new technology being introduced, nor any unproven analytical process. The program defined over the expanse of this document simply explains how K Basins Radiological Control will employ their alpha spectrometer.

2227 (WHC-SD-SNF-PCP-001-Rev.1) 305 Building cold test facility management plan. Feigenbutz, L.V. Westinghouse Hanford Co., Richland, WA (United States). 9 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005140. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides direction for the conduct of business in Building 305 for cold testing K-Basin tools and equipment. The Cold Test Facility represents a small portion of the overall building, and as such, the work instructions already implemented in the 305 Building will be utilized.

2228 (WHC-SD-SNF-TC-001) Test procedure forms for sludge retrieval and packaging. Feigenbutz, L.V. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001597. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides test procedure forms for sludge retrieval and packaging tests in the 305 Cold Test Facility.

The completed and approved forms provide all descriptions, criteria and analysis to safely perform sludge equipment tests in the 305 Cold Test Facility.

2229 (WHC-SD-SP-PHA-001) PRTR/309 building nuclear facility preliminary. Cornwell, B.C. Westinghouse Hanford Co., Richland, WA (United States). 8 Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005164. Source: OSTI; NTIS; INIS; GPO Dep.

The hazard classification of the Plutonium Recycle Test Reactor (PRTR)/309 building as a "Radiological Facility" and the office portions as "Other Industrial Facility" are documented by this report. This report provides: a synopsis of the history and facility it's uses; describes major area of the facility; and assesses the radiological conditions for the facility segments. The assessment is conducted using the hazard category threshold values, segmentation methodology, and graded approach guidance of DOE-STD-1027-92.

2230 (WHC-SD-SP-SSP-001) 309 Building transition plan. Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). 31 Aug 1994. 139p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019054. Source: OSTI; NTIS; INIS; GPO Dep.

The preparation for decontamination and decommissioning (transition) of the 309 Building is projected to be completed by the end of the fiscal year (FY) 1998. The major stabilization and decontamination efforts include the Plutonium Recycle Test Reactor (PRTR), fuel storage and transfer pits, Transfer Waste (TW) tanks and the Ion Exchange Vaults. In addition to stabilizing contaminated areas, equipment, components, records, waste products, etc., will be dispositioned. All nonessential systems, i.e., heating, ventilation, and air conditioning (HVAC), electrical, monitoring, fluids, etc., will be shut down and drained/de-energized. This will allow securing of the process, laboratory, and office areas of the facility. After that, the facility will be operated at a level commensurate with its surveillance needs while awaiting D&D. The implementation costs for FY 1995 through FY 1998 for the transition activities are estimated to be \$1,070K, \$2,115K, \$2,939K, and \$4,762K, respectively. Costs include an assumed company overhead of 20% and a 30% out year contingency.

2231 (WHC-SD-TP-RPT-015) Transportation impact analysis for the shipment of Low Specific Activity Nitric Acid. Green, J.R. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003866. Source: OSTI; NTIS; INIS; GPO Dep.

This document was written in support of the Plutonium-Uranium Extraction (PUREX) Facility Low Specific Activity (LSA) Nitric Acid Shipment Environmental Assessment. It analyzes the potential toxicological and radiological risks associated with the transportation of PUREX Facility LSA Nitric Acid from the Hanford Site in Washington State to three Eastern ports.

2232 (WHC-SD-TP-RPT-017) DOT-7A Type A packaging design guide. Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006707. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Design Guide is to provide instruction for designing a U.S. Department of Transportation Specification 7A (DOT-7A) Type A packaging. Another purpose for this Design Guide is to support the evaluation and testing activities that are performed on new designs by a U.S. Department of Energy (DOE) test facility. This evaluation and testing program is called the DOT-7A Program. When an applicant has determined that a DOT-7A packaging is needed and not commercially available, a design may be created according to this document. The design should include a packaging drawing, specifications, analysis report, operating instructions, and a Packaging Qualification Checklist; all of which should be forwarded to a DOE/HQ approved test facility for evaluation and testing. This report is being submitted through the Engineering Documentation System so that it may be used for reference and information purposes.

2233 (WHC-SD-TP-RPT-018) DOT-7A packaging test procedure. Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006706. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure documents the steps involved with performance testing of Department of Transportation Specification 7A (DOT-7A) Type A packages. It includes description of the performance tests, the personnel involved, appropriate safety considerations, and the procedures to be followed while performing the tests. Westinghouse Hanford Company (WHC) is conducting the evaluation and testing discussed herein for the Department of Energy-Headquarters, Division of Quality Verification and Transportation Safety (EH-321). Please note that this report is not in WHC format. This report is being submitted through the Engineering Documentation System so that it may be used for reference and information purposes.

2234 (WHC-SD-TP-SEP-029) Safety evaluation for packaging transfer of 101-AZ thermocouples. Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 3 Mar 1995. 345p. DOE Contract AC06-87RL10930. Order Number DE95010075. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Evaluation for Packaging (SEP) provides evaluations and analysis considered necessary to approve a short-term onsite transfer campaign of seven thermocouples for the AZ tank to the Central Waste Complex (CWC). The SEP demonstrates that the transfer will provide an equivalent degree of safety as would be provided by the transfer of similar packages meeting the U.S. Department of Energy (DOE)/U.S. Nuclear Regulatory Commission (NRC) requirements. This fulfills onsite transportation requirements implemented by WHC-CM-2-14, Hazardous Material Packaging and Shipping.

2235 (WHC-SD-TP-UM-002-Rev.1) Automated Transportation Management System (ATMS) user's manual: Revision 1. Smith, P.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002278. Source: OSTI; NTIS; INIS; GPO Dep.

The Automated Transportation Management System (ATMS) Software User Guide (SUG) constitutes the user procedures for the ATMS System. Information in this document will be used by the user to operate the automated system. It is intended to be used as a reference manual to

guide and direct the user(s) through the ATMS software product and its environment. The objectives of ATMS are as follows: to better support the Procurement function with freight rate information; to free Transportation Logistics personnel from routine activities such as the auditing and input of freight billing information; to comply with Headquarters Department of Energy-Inspector General (DOE-IG) audit findings to automate transportation management functions; to reduce the keying of data into the Shipment Mobility Accountability Collection (SMAC) database; and to provide automation for the preparing of Bill of Lading, Declaration of Dangerous Goods, Emergency Response Guide and shipping Labels using HM181 Retrieval of hazardous material table text information.

2236 (WHC-SD-W059-PSE-002) Preliminary safety evaluation, Project W-059, B Plant canyon ventilation upgrade. Roege, P.E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008879. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a preliminary evaluation of the feasibility of the project W-059 conceptual design from a safety aspect. A preliminary list of safety related equipment is included.

2237 (WHC-SD-W296-SAD-001) Environmental Restoration Disposal Facility (Project W-296) Safety Assessment. Armstrong, D.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 259p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018509. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Assessment is based on information derived from the Conceptual Design Report for the Environmental Restoration Disposal Facility (DOE/RL 1994) and ancillary documentation developed during the conceptual design phase of Project W-296. The Safety Assessment has been prepared to support the Solid Waste Burial Ground Interim Safety Basis document. The purpose of the Safety Assessment is to provide an evaluation of the design to determine if the process, as proposed, will comply with US Department of Energy (DOE) Limits for radioactive and hazardous material exposures and be acceptable from an overall health and safety standpoint. The evaluation considered effects on the worker, onsite personnel, the public, and the environment.

2238 (WHC-SD-WM-ANAL-039) 242-A Evaporator Condensate Tank (TK-C-100) tie down evaluation. Hundal, T.S. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005975. Source: OSTI; NTIS; INIS; GPO Dep.

The existing Condensate Tank (TK-C-100) in the 242-A Evaporator building is not anchored to the floor slab. This tank is a Safety Class 3 sitting in a Safety Class 2 building. The tank needed to be evaluated to withstand the seismic loads. Anchor bolts have been designed to hold the tank during the seismic event.

2239 (WHC-SD-WM-ANAL-040) 242-A Evaporator ion exchange column (IX-D-1) tie down evaluation. Hundal, T.S. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930.

Order Number DE95005991. Source: OSTI; NTIS; INIS; GPO Dep.

The existing ion exchange column in the 242-A evaporator building is not anchored to the floor slab. This equipment is a Safety Class 3 sitting in a Safety Class 2 building. The column needed to be evaluated to withstand the seismic loads. Anchor bolts have been designed to hold the column during the seismic event.

2240 (WHC-SD-WM-ATP-104) Breathing air trailer acceptance test procedure. Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000343. Source: OSTI; NTIS; GPO Dep.

This Acceptance Test Procedure (ATP) will document compliance with the requirements of WHC-S-0251 Rev. 0 and ECNs 613530 and 606113. The equipment being tested is a Breathing Air Supply Trailer purchased as a Design and Fabrication procurement activity for use in the core sampling program. The ATP was written by the Seller and will be performed by the Seller with representatives of the Westinghouse Hanford Company witnessing the test at the Seller's location. This test procedure is to verify that the American Bristol Industries, Inc., Model 5014-0001 low pressure Mobile Breathing Air Trailer, meets or exceeds the requirements of the Westinghouse Hanford specification.

2241 (WHC-SD-WM-ATR-117) New raw water supply for B-Plant fire foam system. Gainey, T. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005676. Source: OSTI; NTIS; INIS; GPO Dep.

The raw water supply for the B-Plant Canyon foam fire suppression system is being replaced. The 4 inch water supply line to the foam system is being rerouted from the 6 inch raw water line in the Pipe Gallery to the 10 inch raw water main in the Operating Gallery. This document states the acceptance criteria for the flushing and testing which was performed by the contractor, and contains the completed data sheets for the tests. Four tests were performed and documented: operation of the supervisory position indicator; hydrostatic testing; leak check the system; and final system flush.

2242 (WHC-SD-WM-DA-135) 241-U-701 new compressor building and instrument air piping analyses. Huang, F.H. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 235p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001231. Source: OSTI; NTIS; INIS; GPO Dep.

Building anchorage analysis is performed to qualify the design of the new compressor building foundation given in the ECN "241-U-701 New Compressor Building." Recommendations for some changes in the ECN are made accordingly. Calculations show that the 6-in.-slab is capable of supporting the pipe supports, and that the building foundation, air compressor and dryer anchorage, and electric rack are adequate structurally. Analysis also shows that the instrument air piping and pipe supports for the compressed air system meet the applicable code requirements and are acceptable. The building is for the U-Farm instrument air systems.

2243 (WHC-SD-WM-DA-177) Structural Integrity analysis of the 224U elevator mothballing. Boehnke, W.M. Westinghouse Hanford Co., Richland, WA (United

States). 18 Nov 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003998. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the preparation of Building 224U for turnover to Decontamination and Decommissioning, it is necessary to place the elevator in a mothballed condition so that it can be reactivated for use after 10 to 25 years. This mothballing is going to be accomplished by landing the counterweight on wooden timbers and suspending the elevator cab with wire rope or chain slings. This will take the load off the cables and make it relatively easy to reactive. The objective of this Supporting Document is to verify the structural integrity of all of the load bearing components involved in mothballing the 224U Building elevator. Building 224U is part of the UO₃ Plant where uranyl nitrates from the PUREX Plant was converted to UO₃ powder.

2244 (WHC-SD-WM-DA-188) Wind and seismic analysis of AN-107 densitometer and support assemblies. Huang, F.H. Westinghouse Hanford Co., Richland, WA (United States). 21 Mar 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010047. Source: OSTI; NTIS; INIS; GPO Dep.

The analysis of the densitometer and electrical support assemblies considers the sliding and overturning stability in reference to wind and seismic loading. Both assemblies meet the safety class 3 requirements as specified in DOE-RL 1993. The bending stress of the 4-in. riser supporting the densitometer assembly is evaluated to ensure that the requirements of the American Institute for Steel Construction (AISC 1989) are met.

2245 (WHC-SD-WM-DCR-002) 232Z Building seismic assessments. Wagenblast, G.R.; Ryan, J.A. Westinghouse Hanford Co., Richland, WA (United States). 27 Oct 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003157. Source: OSTI; NTIS; INIS; GPO Dep.

The 232Z Building in the 200 West Area has no documented evidence of meeting the structural design requirements for withstanding seismic loadings. The 232Z Building was originally built in 1959. This concrete block structure is south of the 234-5Z Building. The 232Z Building (Incinerator and Leach Facility) start-up occurred in 1961, and the facility has been used for the extraction and recovery of plutonium from contaminated materials. A glovebox incinerator is located in the first floor process area, and was used to incinerate dry wastes from which radioactive materials were then recovered. The design calculations for the original building are not retrievable. The objective of this evaluation is to qualify the 232Z Building in its current configuration for the appropriate seismic loads in accordance with the requirements of SDC 4.1. The structural capacities of the masonry walls and the reinforced concrete slabs and beams of the 232Z Building exceed the dead, live and seismic demand loadings. The building complies with the UBC seismic loading requirements for the 0.20 g maximum ground acceleration earthquake.

2246 (WHC-SD-WM-DP-068) Concrete samples for organic samples, data package and 222-S validation summary report. Addendum 1A. Vogel, R.E. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 559p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. (WHC-SD-WM-DP-068-Add.1A). Order Number DE95003075. Source: OSTI; NTIS; INIS; GPO Dep.

This document is in two parts: the first is the data package entitled "Concrete Samples for Organic Samples" and the second is entitled "Concrete Samples for Organic Samples - Addendum 1A" which is the 222-S validation summary report.

2247 (WHC-SD-WM-ES-313) B Plant: WESF location study. Gehrke, J.W. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002209. Source: OSTI; NTIS; INIS; GPO Dep.

This study evaluates the feasibility of isolating WESF from B Plant. The replacement of WESF support systems is evaluated and one alternative recommended for each system, to be part of a combined project. The relationship of this proposed project and the deactivation of B Plant is discussed and a schedule for implementation recommended.

2248 (WHC-SD-WM-EV-014-Rev.2) Guide for preparing and maintaining generator group pollution prevention program documentation. Revision 2. Floyd, B.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004427. Source: OSTI; NTIS; GPO Dep.

The Hanford Pollution Prevention (P2) program is an organized, comprehensive, and continual effort to: systematically reduce the quantity and toxicity of hazardous, radioactive, mixed, and sanitary wastes; conserve resources; and prevent or minimize pollutant releases to all environmental media from all Hanford Site activities. The program has been developed to meet waste minimization and pollution Prevention public law requirements, federal and state regulations, and US Department of Energy (DOE) requirements. The Hanford P2 program is implemented through the sitewide, contractor, and generator group programs.

2249 (WHC-SD-WM-EV-025-Rev.1) B Plant Complex pollution prevention plan: Revision 1. Beam, T.G. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002235. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has directed Westinghouse Hanford Company (WHC) to develop an effective strategy to minimize the generation of hazardous, radioactive, and mixed wastes at Hanford in compliance with state and federal regulations. WHC has formalized a pollution prevention program composed of management policies, management requirements and procedures. This plan addresses pollution prevention for B Plant Complex. A pollution prevention team is in place and has been assigned responsibility for implementing the plan. This plan includes actions and goals for reducing volume and toxicity of waste generated, as well as a basis for evaluation of progress. Descriptions of waste streams, current specific goals, general pollution prevention methods, and specific accomplishments are in the appendices of this plan.

2250 (WHC-SD-WM-EV-073) Waste analysis plan for 222-S dangerous and mixed waste storage area. Warwick, G.J. Westinghouse Hanford Co., Richland, WA (United States). 30 Aug 1994. 18p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000505. Source: OSTI; NTIS; INIS; GPO Dep.

The 222-S Laboratory Complex, in the southeast corner of the 200 West Area, consists of the 222-S Laboratory, the 222-SA Standards Laboratory, and several ancillary facilities. Currently, 222-S Laboratory activities are in supporting efforts to characterize the waste stored in the 200 Areas single shell and double shell tanks. Besides this work, the laboratory also provides analytical services for waste-management processing plants, Tank Farms, B Plant, 242-A Evaporator Facility, Plutonium-Uranium Extraction Plant, Plutonium Finishing Plant, Uranium-Oxide Plant, Waste Encapsulation Storage Facility, environmental monitoring and surveillance programs, and activities involving essential materials and research and development. One part of the 222-SA Laboratory prepares nonradioactive standards for the 200 Area laboratories. The other section of the laboratory is used for cold (nonradioactive) process development work and standards preparation. The 219-S Waste Handling Facility has three storage tanks in which liquid acid waste from 222-S can be received, stored temporarily, and neutralized. From this facility, neutralized waste, containing radionuclides, is transferred to the Tank Farms. A 700-gallon sodium-hydroxide supply tank is also located in this facility. This plan provides the methods used to meet the acceptance criteria required by the 204-AR Waste Receiving Facility.

2251 (WHC-SD-WM-OMM-011) Void Fraction Instrument operation and maintenance manual. Borgonovi, G.; Stokes, T.I.; Pearce, K.L.; Martin, J.D.; Gimera, M.; Graves, D.B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000799. Source: OSTI; NTIS; INIS; GPO Dep.

This Operations and Maintenance Manual (OMM) addresses riser installation, equipment and personnel hazards, operating instructions, calibration, maintenance, removal, and other pertinent information necessary to safely operate and store the Void Fraction Instrument. Final decontamination and decommissioning of the Void Fraction Instrument are not covered in this document.

2252 (WHC-SD-WM-OTP-169) Operational test procedure for Bldg 241-A-701 air compressor. Desantis, G.N. Westinghouse Hanford Co., Richland, WA (United States). 1 Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006788. Source: OSTI; NTIS; INIS; GPO Dep.

This document is an Operability Test Procedure (OTP) which will verify and record that the 241-A-701 air compressor and associated equipment operates within their intended design parameters. The activities defined in this OTP will be performed to ensure the daily operation of the new compressed air system can be reliable and efficient. The Compressed Air System (CAS) for 241-A-701 supplies process and instrument air to the A, AX, AY, and AZ tank farms. The primary use of the CAS is for tank farms instrumentation, air operated valves, and air lift circulators.

2253 (WHC-SD-WM-OTP-172) B-Plant canyon fire foam supply. Gainey, T. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005674. Source: OSTI; NTIS; INIS; GPO Dep.

A new raw water supply was installed for the B-Plant fire foam system. This document details tests to be performed which will demonstrate that the system can function as designed. The tests include: Verification of the operation of the automatic valves at the cells; Measurement of water flow and pressure downstream of the proportioner; Production of foam, and measurement of foam concentration. Included as an appendix is a copy of the work package resolution (J4 & J4a).

2254 (WHC-SD-WM-OTR-163) Operability test report for 211BA flow proportional sampler. Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004499. Source: OSTI; NTIS; INIS; GPO Dep.

This operability report will verify that the 211-BA flow proportional sampler functions as intended by design. The sampler was installed by Project W-007H and is part of BAT/AKART for the BCE liquid effluent stream.

2255 (WHC-SD-WM-OTR-170) Test and evaluation report, U.S. Department of Transportation Specification 7A Type A radioactive material packaging, WHC Solid Sample Package (unshielded) (3M SafeSend® Reusable Super Pack Shipping System [SP-R1L Kit]). Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). 18 Jan 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005986. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the US Department of Transportation Specification 7A Type A (DOT-7A) compliance test results of the Westinghouse Hanford Company Solid Sample Package, unshielded version. Testing was conducted on two packaging configurations in September 1994. The packagings tested were originally intended to be qualified for transporting liquids having a specific gravity of 2. However, during the 9-m (30-ft) drop tests, the internal polycoated glass bottle either broke or cracked when the packaging impacted the test pad. Therefore, the packaging configurations, as described herein, may be used in transporting solids but not liquids. The packaging configurations described may be transported by air, and meet the applicable International Air Transport Association/International Civil Aviation Organization (IATA/ICAO), Dangerous Goods Regulations, in addition to the DOT-7A requirements.

2256 (WHC-SD-WM-OTR-172) B-Plant canyon fire foam supply. Report. Gainey, T. Westinghouse Hanford Co., Richland, WA (United States). 26 Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006903. Source: OSTI; NTIS; INIS; GPO Dep.

A new raw water supply was installed for the B-Plant fire foam system. This document details tests which were performed to demonstrate that the system can function as designed. The tests included: verification of the operation of the automatic valves at the cells; measurement of water flow and pressure downstream of the proportioner; production of foam, and measurement of foam concentration. Included as an appendix is a copy of the work package resolution (J4 and J4a) which has been signed off as completed.

2257 (WHC-SD-WM-PICD-004) Interface control document between FFTF Transition Project and Solid Waste Disposal Division. Venetz, T.J. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 67p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95003069. Source: OSTI; NTIS; INIS; GPO Dep.

This interface control document between FFTF Transition Project and Solid Waste Disposal (SWD) establishes the functional responsibilities of each division where interfaces exist between the two divisions. The document includes waste volumes and timing for use in planning the proper waste management capabilities.

2258 (WHC-SD-WM-PICD-006) Interface control document between PFP Transition Project and Solid Waste Disposal Division. Venetz, T.J. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005977. Source: OSTI; NTIS; INIS; GPO Dep.

This interface control document between Plutonium Finishing Plant (PFP) Transition Project and Solid Waste Disposal (SWD) establishes the functional responsibilities of each division where interface exist between the two divisions. The document includes waste volumes and timing for use in planning the proper waste management capabilities.

2259 (WHC-SD-WM-TI-616) Dose estimates for the solid waste performance assessment. Rittman, P.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Aug 1994. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000348. Source: OSTI; NTIS; INIS; GPO Dep.

The Solid Waste Performance Assessment calculations by PNL in 1990 were redone to incorporate changes in methods and parameters since then. The ten scenarios found in their report were reduced to three, the Post-Drilling Resident, the Post-Excavation Resident, and an All Pathways Irrigator. In addition, estimates of population dose to people along the Columbia River are also included. The attached report describes the methods and parameters used in the calculations, and derives dose factors for each scenario. In addition, waste concentrations, ground water concentrations, and river water concentrations needed to reach the performance objectives of 100 mrem/yr and 500 person-rem/yr are computed. Internal dose factors from DOE-0071 were applied when computing internal dose. External dose rate factors came from the GENII Version 1.485 software package. Dose calculations were carried out on a spreadsheet. The calculations are described in detail in the report for 63 nuclides, including 5 not presently in the GENII libraries. The spreadsheet calculations were checked by comparison with GENII, as described in Appendix D.

2260 (WHC-SD-WM-TI-675) Test documentation for the GENII Software Version 1.485. Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005168. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

Version 1.485 of the GENII software was released by the PNL GENII custodian in December of 1990. At that time the WHC GENII custodian performed several tests to verify that the advertised revisions were indeed present and that these changes had not introduced errors in the calculations normally done by WHC. These tests were not documented at that time. The purpose of this document is to summarize suitable acceptance tests of GENII and compare them with a few hand calculations. The testing is not as thorough as

that used by the PNL GENII Custodian, but is sufficient to establish that the GENII program appears to work correctly on WHC managed personal computers.

2261 (WHC-SD-WM-TPP-052) UO₃ deactivation end point criteria. Stefanski, L.D. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000736. Source: OSTI; NTIS; INIS; GPO Dep.

The UO₃ Deactivation End Point Criteria are necessary to facilitate the transfer of the UO₃ Facility from the Office of Facility Transition and Management (EM-60) to the office of Environmental Restoration (EM-40). The criteria were derived from a logical process for determining end points for the systems and spaces at the UO₃ Facility based on the objectives, tasks, and expected future uses pertinent to that system or space. Furthermore, the established criteria meets the intent and supports the draft guidance for acceptance criteria prepared by EM-40, "U.S. Department of Energy office of Environmental Restoration (EM-40) Decontamination and Decommissioning Guidance Document (Draft)." For the UO₃ Facility, the overall objective of deactivation is to achieve a safe, stable and environmentally sound condition, suitable for an extended period, as quickly and economically as possible. Once deactivated, the facility is kept in its stable condition by means of a methodical surveillance and maintenance (S&M) program, pending ultimate decontamination and decommissioning (D&D). Deactivation work involves a range of tasks, such as removal of hazardous material, elimination or shielding of radiation fields, partial decontamination to permit access for inspection, installation of monitors and alarms, etc. it is important that the end point of each of these tasks be established clearly and in advance, for the following reasons: (1) End points must be such that the central element of the deactivation objective - to achieve stability - is unquestionably achieved. (2) Much of the deactivation work involves worker exposure to radiation or dangerous materials. This can be minimized by avoiding unnecessary work. (3) Each task is, in effect, competing for resources with other deactivation tasks and other facilities. By assuring that each task is appropriately bounded, DOE's overall resources can be used most fully and effectively.

2262 (WHC-SD-WM-UM-019) The grout/glass performance assessment code system (GPACS) with verification and benchmarking. Piepho, M.G.; Sutherland, W.H.; Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006889. Source: OSTI; NTIS; INIS; GPO Dep.

GPACS is a computer code system for calculating water flow (unsaturated or saturated), solute transport, and human doses due to the slow release of contaminants from a waste form (in particular grout or glass) through an engineered system and through a vadose zone to an aquifer, well and river. This dual-purpose document is intended to serve as a user's guide and verification/benchmark document for the Grout/Glass Performance Assessment Code system (GPACS). GPACS can be used for low-level-waste (LLW) Glass Performance Assessment and many other applications including other low-level-waste performance assessments and risk assessments. Based on all the cses presented, GPACS is adequate (verified) for calculating water flow and contaminant transport in unsaturated-zone sediments and for calculating human doses via the groundwater pathway.

2263 (WHC-SP-0564-33) **Westinghouse Hanford Company health and safety performance report, First quarter calendar year 1994.** Lansing, K.A. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014631. Source: OSTI; NTIS; GPO Dep.

Safety training programs for the employee, manager, and safety observer are undergoing refinements in response to employee suggestions as well as to promote the interactions necessary to the success of the Voluntary Protection Program. Adjustments to these programs are described on pages 2-1 and 2-2. Significant events, which carry lessons we must learn in order to reduce injury potential, are summarized on pages 2-2 and 2-3. The events highlighted this quarter involve indoor air quality and unexpected weather changes which can impact outdoor work activities. Our analysis of injuries occurring this reporting period continues to feature the simple-task injuries which reflect on awareness levels and culture strength. In addition to injuries arising from simple, everyday tasks, a significant number of injuries were caused by objects in "blind spots". These are items placed out of view where an employee can contact them by reaching in to a drawer (staples, exacto blades, etc.), or by bumping/brushing against (wall hangings, sharp furniture edges).

2264 (WHC-SP-0841-Rev.2) **Maintenance Implementation plan for the plutonium finishing plant. Revision 2.** Meldrom, C.A. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010110. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the Maintenance Implementation Plan (MIP) for the Plutonium Finishing Plant (PFP) located at the Hanford site at Richland, Washington. This MIP addresses the maintenance program at PFP as it relates to DOE Order 4330.4B. This MIP addresses those actions identified to be worked on in the Fiscal Year (FY) 95/96 timeframe. Full compliance with 4330.4B will take several years. Actions taken will occur in a sequence determined by a graded approach and startup readiness review. PFP is currently working toward the cleanout and stabilization operation which began in November 1994. Thermal stabilization of sludge process uses one glovebox of the facility. This process is presently being looked at being expanded to 12 furnaces. A graded approach is utilized to dictate the priorities of the improvement/upgrade activities identified in Chapter 4.0 of this document. The graded approach utilized a managerial assessment of the order elements using a number of different inputs. Inputs considered included a DOE Order 4330.4B self-assessment of PFP. The PFP Maintenance strategy is to provide the facility with systems and equipment that will be able to sustain the scheduled operation of this section of the PFP. This operating run is scheduled to last seven years. Activities following the stabilization operation will involve completing an Environmental Impact Statement (EIS) to determine future plant activities. This strategy also includes long-term maintenance of the facility for safe occupancy and material storage. The major improvement activities identified in this MIP are in the areas of organization, administration, and maintenance procedures. Other key focuses will be in planning and scheduling and in management involvement. The schedule is based upon application of the graded approach with consideration of known resources available.

2265 (WHC-SP-0849) **Vegetation management 1994 fiscal year end report.** Rodriguez, J.M. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008791. Source: OSTI; NTIS; INIS; GPO Dep.

This year-end report evaluates vegetation management operations on the Hanford reservation conducted during fiscal year (FY) 1994 and proposed control methods to be used in FY 1995 and following years. The 1995 control methods proposed are based on an evaluation of past and current ALARA principles, employee safety, environmental impacts, applicable regulations, site esthetics, and other site-specific factors.

2266 (WHC-SP-0903-Rev.1) **NEPA Source Guide for the Hanford Site. Revision 1.** Rued, W.J. Westinghouse Hanford Co., Richland, WA (United States). 24 Oct 1994. 259p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002461. Source: OSTI; NTIS; INIS; GPO Dep.

This Source Guide will assist those working with the National Environmental Policy Act of 1969 (NEPA) to become more familiar with the Environmental Assessments (EA) and Environmental Impact Statements (EIS) that apply to specific activities and facilities at the Hanford Site. This document should help answer questions concerning NEPA coverage, history, processes, and the status of many of the buildings and units on and related to the Hanford Site. This document summarizes relevant EAs and EISs by briefly outlining the proposed action of each and the decision made by the US Department of Energy (DOE) or its predecessor agencies, the US Atomic Energy Commission (AEC), and the US Energy Research and Development Administration (ERDA), concerning the proposed action and current status of the buildings and units discussed in the proposed action. If a decision was officially stated by the DOE, as in a finding of no significant impact (FONSI) or a Record of Decision (ROD), and was located, a summary is provided in the text. Not all federal decisions, such as FONSI and RODS, can be found in the Federal Register (FR). For example, although significant large-action FONSI can be found in the FR, some low-interest FONSI may have been published elsewhere.

2267 (WHC-SP-1094-FY94) **Site Maintenance Plan: Part 2, Site Maintenance Action Plan for FY 1994.** Fisk, E.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018159. Source: OSTI; NTIS; INIS; GPO Dep.

This Fiscal Year (FY) 1994 Site Maintenance Action Plan (SMAP) is Part II of the Site Maintenance Plan, and has been written by Westinghouse Hanford Company (WHC) to outline the requirements stated in DOE Order 4330.4B, Maintenance Management Program, Chapter 1, Paragraph 3.3.1. The SMAP provides an annual status of maintenance initiatives completed and planned, a summary of performance indicators, a summary of maintenance backlog, a listing of real property and capital equipment maintenance cost estimates that were used to create the FY 1996 infrastructure and maintenance budget input, and a listing of proposed line item and general plant projects. Additionally, assumptions for various Site programs are listed to bring the Site Maintenance Plan into focus with overall Site activities. The primary mission at Hanford is to clean up the Site. In this cleanup process WHC will provide scientific and technological expertise to meet global needs, and partnership with

stakeholders in the region to develop regional economic diversification. Other missions at the Hanford Site include energy research and development, and waste management and disposal activities. Their primary mission has a 30-year projected life span and will direct the shutting down and cleanup of defense production facilities and the Fast Flux Test Facility. This long-term mission requires continuous maintenance and in many instances, replacement of existing basic infrastructure, support facilities, and utilities. Without adequate maintenance and capital funding these infrastructure, support facilities, and utilities will continue to deteriorate causing an increase in backlogged work.

2268 (WHC-SP-1108) Quality assurance FY 1995 site support program plan WBS 6.7.2.5. Dell, L.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004976. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a summary of the quality assurance plan and program for the Westinghouse Hanford Company. The quality assurance plan verifies that the appropriate quality assurance programs and controls are applied to activities that affect quality related to work in: waste management; environmental activities (restoration, remediation, and monitoring); implementation of environmental, state, local, and federal regulations; tri-party agreement activities; facility operation and deactivation/transition to shutdown; new facility construction and operation.

2269 (WHC-SP-1112) Environmental support FY 1995 multi-year program plan/fiscal year work plan WBS 1.5.2/7.4.11. Moore, D.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 248p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005598. Source: OSTI; NTIS; INIS; GPO Dep.

The multi-Year Program Plan (MYPP) is the programmatic planning baseline document for technical, schedule, and cost data. The MYPP contains data by which all work is managed, performed and controlled. The integrated planning process, defined by RL, is redicted on establishment of detailed data in the MYPP. The MYPP includes detailed information for the data elements including Level II critical path schedules, cost estimate detail, and updated technical data to be done annually. There will be baseline execution year and out year approval with work authorization for execution. The MYPP will concentrate on definition of the scope, schedule, cost and program element level critical path schedules that show the relationship of planned activities. The Fiscal Year Work Plan (FYWP) is prepared for each program to provide the basis for authorizing fiscal year work. The MYPP/FYWP will be structured into three main areas: (1) Program Overview; (2) Program Baselines; (3) Fiscal Year Work Plan.

2270 (WHC-SP-1116) Overheads, Safety Analysis and Engineering FY 1995 Site Support Program Plan WBS 6.3.5. DiVincenzo, E.P. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001577. Source: OSTI; NTIS; INIS; GPO Dep.

The Safety Analysis & Engineering (SA&E) department provides core competency for safety analysis and risk documentation that supports achievement of the goals and mission as described in the Hanford Mission Plan, Volume I,

Site Guidance (DOE-RL 1993). SA&E operations are integrated into the programs that plan and conduct safe waste management, environmental restoration, and operational activities. SA&E personnel are key members of task teams assigned to eliminate urgent risks and inherent threats that exist at the Hanford Site. Key to ensuring protection of public health and safety, and that of onsite workers, are the products and services provided by the department. SA&E will continue to provide a leadership role throughout the DOE complex with innovative, cost-effective approaches to ensuring safety during environmental cleanup operations. The SA&E mission is to provide support to direct program operations through safety analysis and risk documentation and to maintain an infrastructure responsive to the evolutionary climate at the Hanford Site. SA&E will maintain the appropriate skills mix necessary to fulfill the customers need to conduct all operations in a safe and cost-effective manner while ensuring the safety of the public and the onsite worker.

2271 (WHC-SP-1126-Vol.1) Transition projects FY 1995 multi-year program/fiscal year work plan WBS 1.3.1. and 7.1. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 528p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001821. Source: OSTI; NTIS; INIS; GPO Dep.

The primary Transition Projects mission is to deactivate facilities on the Hanford site, in preparation for decontamination and decommissioning, and secondarily to provide safe and secure storage of special nuclear materials, nuclear materials, and nuclear fuel. Transition projects will protect the health and safety of the public and of workers, protect the environment, and provide beneficial use of the facilities and other resources. Goals include the following: Achieve deactivation of facilities for transfer to the Hanford Surplus Facility Program, suing PUREX plant deactivation as a model; Achieve excellence in the conduct of operations and maintenance of nuclear facilities in support of the Hanford Site Mission; manage nuclear materials in a safe and secure condition; treat nuclear materials as necessary and store onsite in long-term interim safe storage awaiting a final disposition decision. Description of the program and projects is included.

2272 (WHC-SP-1126-Vol.2) Transition projects FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 1.3.1 and 7.1: Volume 2. Cartmell, D.B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 272p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001822. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains information concerning the management of the Hanford Reservation. Information concerning the departmental schedules is presented in chart form. The following departmental schedules are included: The B-plant/Cesium Capsule Recovery, 300 Area Fuel Supply Program, Plutonium Finishing Plant, and Program and Environmental Management.

2273 (WHC-SP-1126-Vol.3) Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1. Cartmell, D.B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001823. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a complete listing and time line of transitional projects associated with the Purex/UO₃ deactivation project at the Hanford reservation.

2274 (WHC-SP-1139) Westinghouse Hanford Company FY 1995 Materials Management Plan (MMP). Higginson, M.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005635. Source: OSTI; NTIS; INIS; GPO Dep.

The safe and sound operation of facilities and storage of nuclear material are top priorities within Hanford's environmental management, site restoration mission. The projected materials estimates, based on the Materials Management Plan (MMP) assumptions outlined below, were prepared for Department of Energy (DOE) use in long-range planning. The Hanford MMP covers the period FY 1995 through FY 2005, as directed by DOE. All DOE Richland Operations (RL) Office facilities are essentially funded by the Office of Transition and Facilities Management, Environmental Restoration and Waste Management (EM). These facilities include PUREX, the UO₃ plant, N-Reactor, T-Plant, K-Basins, FFTF, PFP and the 300 Area Fuel Fabrication facilities. Currently DP provides partial funding for the latter two facilities. Beginning in FY 1996 (in accordance with DOE-HQ MMP assumptions), EM will fund expenses related to the storage, monitoring, and safeguarding of all Special Nuclear Material (SNM) in the PFP. Ownership and costs related to movement and/or stabilization of that material will belong to EM programs (excluding NE material). It is also assumed that IAEA will take over inventory validation and surveillance of EM owned SNM at this time (FY 1996).

2275 (WHC-SP-1147) PUREX/UO₃ facilities deactivation lessons learned history. Hamrick, D.G.; Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007185. Source: OSTI; NTIS; INIS; GPO Dep.

The Plutonium-Uranium Extraction (PUREX) Facility operated from 1956-1972, from 1983-1988, and briefly during 1989-1990 to produce for national defense at the Hanford Site in Washington State. The Uranium Trioxide (UO₃) Facility operated at the Hanford Site from 1952-1972, 1984-1988, and briefly in 1993. Both plants were ordered to permanent shutdown by the U.S. Department of Energy (DOE) in December 1992, thus initiating their deactivation phase. Deactivation is that portion of a facility's life cycle that occurs between operations and final decontamination and decommissioning (D&D). This document details the history of events, and the lessons learned, from the time of the PUREX Stabilization Campaign in 1989-1990, through the end of the first full fiscal year (FY) of the deactivation project (September 30, 1994).

2276 (WHC-SP-1149) Status of outdoor radioactive contamination at the Hanford Site. McKinney, S.M.; Markes, B.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005599. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the status of outdoor radioactive contamination near Hanford Site facilities and disposal

sites. It defines the nature and areal extent of the radioactively contaminated areas and describes the historical, ongoing, and planned radiological monitoring and control activities. Radioactive waste has been disposed of to the soil column since shortly after the reactors and production facilities began operating. Radioactive liquid wastes were placed directly into the ground via liquid discharges to cribs, ponds, ditches, and reverse wells. Solid wastes were placed in trenches, burial vaults, and caissons. Although the Hanford Site covers 1,450 km², the radioactively contaminated area is only about 36 km² or 2.5% of the original site. Over time, contamination has migrated from some of the waste management sites through various vectors (e.g., burrowing animals, deep-rooted vegetation, erosion, containment system failure) or has been deposited to the surface soil via spills and unplanned releases (e.g., line leaks/breaks, tank leaks, and stack discharges) and created areas of outdoor radioactivity both on and below the surface. Currently 26 km² are posted as surface contamination and 10 km² are posted as underground contamination.

2277 (WHC-SP-1154) 340 Facility maintenance Implementation plan. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010112. Source: OSTI; NTIS; INIS; GPO Dep.

This Maintenance Implementation Plan (MIP) has been developed for maintenance functions associated with the 340 Facility. This plan is developed from the guidelines presented by Department of Energy (DOE) Order 4330.4B, Maintenance Management Program (DOE 1994), Chapter II. The objective of this plan is to provide baseline information for establishing and identifying Westinghouse Hanford Company (WHC) conformance programs and policies applicable to implementation of DOE order 4330.4B guidelines. In addition, this maintenance plan identifies the actions necessary to develop a cost-effective and efficient maintenance program at the 340 Facility. Primary responsibility for the performance and oversight of maintenance activities at the 340 Facility resides with Westinghouse Hanford Company (WHC). Maintenance at the 340 Facility is performed by ICF-Kaiser Hanford (ICF-KH) South Programmatic Services crafts persons. This 340 Facility MIP provides interface requirements and responsibilities as they apply specifically to the 340 Facility. This document provides an implementation schedule which has been developed for items considered to be deficient or in need of improvement. The discussion sections, as applied to implementation at the 340 Facility, have been developed from a review of programs and practices utilizing the graded approach. Biennial review and additional reviews are conducted as significant programmatic and mission changes are made. This document is revised as necessary to maintain compliance with DOE requirements.

2278 (WINCO-1123-Rev.1) The Radiological Safety Analysis Computer Program (RSAC-5) user's manual: Revision 1. Wenzel, D.R. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Feb 1994. 262p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013373. Source: OSTI; NTIS; INIS; GPO Dep.

The Radiological Safety Analysis Computer Program (RSAC-5) calculates the consequences of the release of radionuclides to the atmosphere. Using a personal computer, a user can generate a fission product inventory from either reactor operating history or nuclear criticalities. RSAC-5

models the effects of high-efficiency particulate air filters or other cleanup systems and calculates decay and ingrowth during transport through processes, facilities, and the environment. Doses are calculated through the inhalation, immersion, ground surface, and ingestion pathways. RSAC+, a menu-driven companion program to RSAC-5, assists users in creating and running RSAC-5 input files. This user's manual contains the mathematical models and operating instructions for RSAC-5 and RSAC+. Instructions, screens, and examples are provided to guide the user through the functions provided by RSAC-5 and RSAC+. These programs are designed for users who are familiar with radiological dose assessment methods.

2279 (WINCO-1138) Decontamination of metals by melt refinings/slugging: An annotated bibliography. Mizia, R.E. (ed.); Worcester, S.A.; Twidwell, L.G.; Paolini, D.J.; Weldon, T.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jul 1993. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013802. Source: OSTI; NTIS; INIS; GPO Dep.

As the number of nuclear installations undergoing decontamination and decommissioning (D&D) increases, current radioactive waste storage space is consumed and establishment of new waste storage areas becomes increasingly difficult, the problem of handling and storing radioactive scrap metal (RSM) gains increasing importance in the DOE Environmental Restoration and Waste Management Program. To alleviate present and future waste storage problems, Westinghouse Idaho Nuclear Company (WINCO) is managing a program for the recycling of RSM for beneficial use within the DOE complex. As part of that effort, Montana Tech has been awarded a contract to help optimize melting and refining technology for the recycling of stainless steel RSM. The scope of the Montana Tech program includes a literature survey, a decontaminating slag design study, small scale melting studies to determine optimum slag compositions for removal of radioactive contaminant surrogates, analysis of preferred melting techniques, and coordination of large scale melting demonstrations (100-500 lbs) to be conducted at selected facilities. The program will support recycling and decontaminating stainless steel RSM for use in waste canisters for Idaho Waste Immobilization Facility densified high level waste. This report is the result of the literature search conducted to establish a basis for experimental melt/slag program development.

2280 (WINCO-1168) Use of base isolation techniques for the design of high-level waste storage facility enclosure at INEL. Vallenias, J.M. (Cygn Energy Services, Oakland, CA (United States)); Wong, Chun K.; Beer, M.J. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Aug 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013806. Source: OSTI; NTIS; INIS; GPO Dep.

Current Department of Energy criteria for facilities subjected to natural hazards provide guidelines to place facilities or portions of facilities into usage categories. Usage categories are based on characteristics such as mission dependence, type of hazardous materials involved, and performance goals. Seismic requirements are significantly more stringent for facilities falling into higher "hazard facility use categories". A special problem arises in cases where a facility or portion of a facility is dependent on another facility of lower "hazard facility use category" for support or protection.

Creative solutions can minimize the cost impact of ensuring that the lower category item does not compromise the performance of the higher category item. In this paper, a base isolation solution is provided for a "low hazard facility use category" weather enclosure designed so it will not collapse onto a "high hazard facility use category" high level waste storage facility at INEL. This solution is compared to other more conventional procedures. Details, practical limitations, licensing and regulatory considerations, and cost comparisons are provided.

2281 (WINCO-1188) Development of simulated contamination (SIMCON) and miscellaneous decontamination scoping tests. Demmer, R.L. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jan 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013807. Source: OSTI; NTIS; INIS; GPO Dep.

This report details the development of a method of simulating ICPP type contamination (SIMCON) with surrogate, nonradioactive materials and some miscellaneous testing and results that were completed using SIMCON. An analysis of historical ICPP decontamination samples is given, along with the justification relating SIMCON to this historical data. Some SIMCON testing of the following methods are given as miscellaneous examples: water rinse, water ultrasonic, ferric nitrate, CO₂ snowflake blasting, nitrogen "Cryogenic" blasting and strippable coating removal.

2282 (WINCO-1190) Radioactive scrap metal market study: Use of RSM by electric utility industry for spent fuel storage. Mizia, R.E.; Wahnschaffe, S.D. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jan 1994. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013808. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the results of an effort to evaluate the restricted use of radioactive scrap metal (RSM) and more specifically contaminated stainless steel, to be removed at the time of electric utility nuclear plant decommissioning for fabrication of canisters to store spent nuclear fuel (SNF). The focus is on the US domestic industry. Interest in pursuing this study was driven by a need within the Federal Department of Energy to find solutions to high level waste storage and disposal requirements including both SNF and materials resulting from defense production facilities clean up and dismantlement.

2283 (WINCO-1221) Waste Calcining Facility remote inspection report. Patterson, M.W.; Ison, W.M. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Aug 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94019088. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Waste Calcining Facility (WCF) remote inspections was to evaluate areas in the facility which are difficult to access due to high radiation fields. The areas inspected were the ventilation exhaust duct, waste hold cell, adsorber manifold cell, off-gas cell, calciner cell and calciner vessel. The WCF solidified acidic, high-level mixed waste generated during nuclear fuel reprocessing. Solidification was accomplished through high temperature oxidation and evaporation. Since its shutdown in 1981, the WCFs vessels, piping systems, pumps, off-gas blowers and process cells have remained contaminated. Access to the below-grade areas is limited due to contamination and high radiation fields. Each inspection technique was tested with a mock-up in a

radiologically clean area before the equipment was taken to the WCF for the actual inspection. During the inspections, essential information was obtained regarding the cleanliness, structural integrity, in-leakage of ground water, indications of process leaks, indications of corrosion, radiation levels and the general condition of the cells and equipment. In general, the cells contain a great deal of dust and debris, as well as hand tools, piping and miscellaneous equipment. Although the building appears to be structurally sound, the paint is peeling to some degree in all of the cells. Cracking and spalling of the concrete walls is evident in every cell, although the east wall of the off-gas cell is the worst. The results of the completed inspections and lessons learned will be used to plan future activities for stabilization and deactivation of the facility. Remote clean-up of loose piping, hand tools, and miscellaneous debris can start immediately while information from the inspections is factored into the conceptual design for deactivating the facility.

2284 (WINCO-1224) Refining technology for the recycling of stainless steel radioactive scrap metals, FY 94 bi-annual report. Mizia, R.E. (ed.) (Westinghouse Idaho Nuclear Co., Idaho Falls, ID (United States). Metal Recycle); Atteridge, D.G.; Buckentin, J.; Carter, J.; Davis, H.L.; Devletian, J.H.; Scholl, M.R.; Turpin, R.B.; Webster, S.L. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Aug 1994. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE95000832. Source: OSTI; NTIS; INIS; GPO Dep.

The research addressed under this project is the recycling of metallic nuclear-related by-product materials under the direction of Westinghouse Idaho Nuclear Company (WINCO). The program addresses the recycling of radioactive scrap metals (RSM) for beneficial re-use within the DOE complex; in particular, this program addresses the recycling of stainless steel RSM. It is anticipated that various stainless steel components under WINCO control at the Idaho Falls Engineering Laboratory (INEL), such as fuel pool criticality barriers and fuel storage racks will begin to be recycled in FY94-95. The end product of this recycling effort is expected to be waste and overpack canisters for densified high level waste for the Idaho Waste Immobilization Facility and/or the Universal Canister System for dry (interim) storage of spent fuel. The specific components of this problem area that are presently being, or have been, addressed by CAAMSEC are: (1) the melting/remelting of stainless steel RSM into billet form; (2) the melting/remelting initial research focus will be on the use of radioactive surrogates to study; (3) the cost effectiveness of RSM processing oriented towards privatization of RSM reuse and/or resale. Other components of this problem that may be addressed under program extension are: (4) the melting/remelting of carbon steel; (5) the processing of billet material into product form which shall meet all applicable ASTM requirements; and, (6) the fabrication of an actual prototypical product; the present concept of an end product is a low carbon Type 304/316 stainless steel cylindrical container for densified and/or vitrified high level radioactive waste and/or the Universal Canister System for dry (interim) storage of spent fuel. The specific work reported herein covers the melting/remelting of stainless steel "scrap" metal into billet form and the study of surrogate material removal effectiveness by various remelting techniques.

2285 (WINCO-1226) Radioactive scrap metal (RSM) inventory & tracking system and prototype RSM field survey. Thomas, T.R. Westinghouse Idaho Nuclear Co.,

Inc., Idaho Falls, ID (United States). Sep 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE95000776. Source: OSTI; NTIS; INIS; GPO Dep.

Based on very preliminary information, it has been estimated that the radioactive scrap metal (RSM) inventories at DOE facilities amount to about 1.5 million tons and a much larger amount will be generated from decontamination and decommissioning of surplus DOE facilities. To implement a national DOE program for beneficial reuse of RSM, it will be necessary to know the location and characteristics of RSM inventories that are available and will be generated to match them with product demands. It is the intent of this task to provide a standardized methodology via a RSM database for recording, tracking, and reporting data on RSM inventories. A multiple relational database in dBASE IV was designed and a PC-based code was written in Clipper 5.0 syntax to expedite entry, editing, querying, and reporting of RSM survey data. The PC based-code, the multiple relational database files, and other external files used by the code to generate reports and queries constitute a customized software application called the RSM Inventory & Tracking System (RSM I&TS). A prototype RSM field survey was conducted at the Nevada Test Site (NTS) to demonstrate the field use of the RSM I&TS and logistics of conducting the survey. During the demonstration, about 50 tons of RSM were sized, characterized, sorted, and packaged in transport containers.

2286 (WINCO-1228) Testing and evaluation of eight decontamination chemicals. Demmer, R. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE95000777. Source: OSTI; NTIS; INIS; GPO Dep.

This report covers experimental work comparing eight different decontamination chemicals. Seven of these chemicals have some novelty, or are not currently in use at the ICPP. The eighth is a common ICPP decontamination reagent used as a baseline for effective comparison. Decontamination factors, waste generation values, and corrosion rates are tabulated for these chemicals. Recommendations are given for effective methods of non-sodium or low-sodium decontamination chemicals. The two most effective chemical for decontamination found in these test were a dilute hydrofluoric and nitric acid (HF/HNO₃) mixture and a fluoroboric acid solution. The fluoroboric acid solution (1 molar) was by far the most effective decontamination reagent, but suffered the problem of generating significant final calcine volume. The HF/HNO₃ solution performed a very good decontamination of the SIMCON coupons while generating only small amounts of calcine volume. Concentration variables were also tested, and optimized for these two solutions. Several oxidation/reduction decon chemical systems were also tested. These systems were similar to the TURCO 4502 and TURCO 4521 solutions used for general decontamination at the ICPP. A low sodium alternative, nitric acid/potassium permanganate, to the "high sodium" TURCO 4502 was tested extensively, optimized and recommended for general ICPP use. A reductive chemical solution, oxalic acid/nitric acid was also shown to have significant advantages.

2287 (WSRC-MS-94-0595) Radiological consequences of a propagated fire accident in a radiochemical separations facility. Hope, E.P.; Ades, M.J. Westinghouse Savannah River Co., Aiken, SC (United

States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950439-4: SMS simulation multiconference: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95005485. Source: OSTI; NTIS; INIS; GPO Dep.

A radiological consequence analysis of a propagated fire accident in a Savannah River Site (SRS) radiochemical separations facility has been performed. This analysis supports the safety documentation for the SRS plutonium reprocessing facility. Included are the evaluation of the doses resulting from the exposure to the radioactive airborne release for co-located facility worker and the off-site individual receptors. Atmospheric dispersion calculations using qualified five-year (1987-1991) meteorological data were performed with the computer code AXAIR89Q, a validated computer code for radiological dose calculations. Radioactive source term estimates and assumptions of material composition and isotope distribution were based on existing permissible storage levels as defined in approved safety documentation. The fire accident scenario assumes that the fire propagates in the entire facility on four structural levels. Approximately 97% of the radioactive materials released occurs from levels three and four of the facility, which are not included in the ventilation pathway to the sand trap filter. Radiological analysis results indicate that the doses to co-located worker and off-site individual receptors are equal to 4.4 rem and 3.3 rem, respectively. Accident mitigators that were identified include provision for filtration capacity from levels three and four of the facility, and relocation of stored radioactive materials. Provision for filtration capacity would reduce the source term from an unfiltered activity of 53.6 Ci to a filtered activity of 2.0 Ci. Relocation of stored radioactive materials would result in a source term reduction from 53.6 Ci to 20 Ci. Limitations exist, however, that may make implementation of the identified mitigators difficult or prohibitive.

2288 (WSRC-TR-94-0538) Determination of frequencies of contamination and fire related incidents for DWPF SAR. Hovis, G.L.; Harvel, C.D.; Abear, J.W.; Sims, C.H. Westinghouse Savannah River Co., Aiken, SC (United States). 15 Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005481. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the Risk Analysis group (RAG), and in support of the DWPF SAR, the Safety Information Management and Analysis group (SIMA) determined specific frequency and unavailability values dealing with contamination and fire related incidents. All results summarized herein are based upon actual facility operating data from the 200-Area Fault Tree Data Bank. The SAS statistical package was utilized to compute annual frequencies from appropriate event data. All calculations have been technically reviewed to ensure that they are accurate mathematical representations of actual operating history as recorded in the data bank.

2289 (WSRC-TR-94-0554-Rev.1) Zink rotary kiln seal: Cam followers. Revision 1. Fisher, D.L. Westinghouse Savannah River Co., Aiken, SC (United States). 9 Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95010956. Source: OSTI; NTIS; GPO Dep.

The CIF will treat hazardous and mixed low-level radioactive waste in a rotary kiln and secondary combustion

chamber. A high efficiency air pollution control system follows the secondary chamber. The rotary kiln is designed with a gas seal at each end of its rotating barrel which provides a barrier between the interior of the kiln and outside air. The internal pressure of the rotary kiln will be maintained below atmospheric pressure, so exterior air passing the seals is forced into the kiln's interior. Positive pressure may be applied in the seal labyrinth, adding a barrier to flow. Both CIF seals will be covered entirely with exhaust hoods, drawing air over the outside of the seal and into a HEPA filtered exhaust system. Cam follower misalignment on a John Zink rotary kiln seal caused damage to the seal's rotor. The misalignment was quantified, corrected, and checked to verify straightness. The primary purpose of the correction was to allow seal testing 1 to continue, but the information is applicable to the Consolidated Incineration Facility (CIF) since two large seals of similar design will be installed there. Cam follower straightness was off as much as 3.5°, causing followers to run untrue on the rotor. High contact forces resulted, removing flakes of metal from the rotor surface. The misalignment caused weight bearing followers on one side of the seal to back out of their threaded mounts. The root cause was poor machining of the follower mounting holes. Correction was accomplished by relieving the holes and installing machined spacers and retaining nuts. Cam followers on the CIF's Zink seals should be inspected for straightness before the seals are installed.

2290 (Y/ER-158) Closure certification report for the Bear Creek burial grounds B area and walk-in pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States). Jun 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95001769. Source: OSTI; NTIS; INIS; GPO Dep.

On July 5, 1993, the revised RCRA Closure Plan for the Bear Creek Burial Grounds B Area and Walk-In Pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, DOE/OR/01-1100&D3 and Y/ER-53&D3, was approved by the Tennessee Department of Environment and Conservation (TDEC). The closure activities described in that closure plan have been performed. The purpose of this document is to summarize the closure activities for B Area and Walk-In Pits (WIPs), including placement of the Kerr Hollow Quarry debris at the WIPs.

2291 (Y/ER-159/V1) Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4. Volume 1: Technology evaluation. Oak Ridge National Lab., TN (United States). Sep 1994. 260p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009067. Source: OSTI; NTIS; INIS; GPO Dep.

During World War II, the Oak Ridge Y-12 Plant was built as part of the Manhattan Project to supply enriched uranium for weapons production. In 1945, Building 9201-4 (Alpha-4) was originally used to house a uranium isotope separation process based on electromagnetic separation technology. With the startup of the Oak Ridge K-25 Site gaseous diffusion plant in 1947, Alpha-4 was placed on standby. In 1953, the uranium enrichment process was removed, and installation of equipment for the Colex process began. The Colex process—which uses a mercury solvent and lithium hydroxide as the lithium feed material—was shut down in 1962 and drained of process materials. Residual quantities of mercury and lithium hydroxide have remained in the process equipment. Alpha-4 contains more than one-half million ft² of floor

area; 15,000 tons of process and electrical equipment; and 23,000 tons of insulation, mortar, brick, flooring, handrails, ducts, utilities, burnables, and sludge. Because much of this equipment and construction material is contaminated with elemental mercury, cleanup is necessary. The goal of the Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 is to provide a planning document that relates decontamination and decommissioning and waste management problems at the Alpha-4 building to the technologies that can be used to remediate these problems. The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 builds on the methodology transferred by the U.S. Air Force to the Environmental Management organization with DOE and draws from previous technology logic diagram-efforts: logic diagrams for Hanford, the K-25 Site, and ORNL.

2292 (Y/ER-159/V3/Pt.A) Y-12 Plant decontamination and decommissioning technology logic diagram for Building 9201-4. Volume 3: Technology evaluation data sheets; Part A: Characterization, dismantlement. Oak Ridge K-25 Site, TN (United States). Sep 1994. 412p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009068. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 (TLD) was developed to provide a decision-support tool that relates decontamination and decommissioning (D and D) problems at Bldg. 9201-4 to potential technologies that can remediate these problems. The TLD uses information from the Strategic Roadmap for the Oak Ridge Reservation, the Oak Ridge K-25 Site Technology Logic Diagram, the Oak Ridge National Laboratory Technology Logic Diagram, and a previous Hanford logic diagram. This TLD identifies the research, development, demonstration, testing, and evaluation needed for sufficient development of these technologies to allow for technology transfer and application to D and D and waste management (WM) activities. It is essential that follow-on engineering studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in the TLD and by finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk. This report consists of the characterization and dismantlement data sheets.

2293 (Y/ER-159/V3/Pt.B) Y-12 Plant decontamination and decommissioning technology logic diagram for Building 9201-4. Volume 3: Technology evaluation data sheets; Part B: Decontamination, robotics/automation, waste management. Oak Ridge K-25 Site, TN (United States). Sep 1994. 404p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009069. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 (TLD) was developed to provide a decision-support tool that relates decontamination and decommissioning (D and D) problems at Bldg. 9201-4 to potential technologies that can remediate these problems. The TLD uses information from the Strategic Roadmap for the Oak Ridge Reservation, the Oak Ridge K-25 Site Technology Logic Diagram, the Oak Ridge National Laboratory Technology Logic Diagram, and a previous Hanford logic diagram. This TLD identifies the research, development, demonstration, testing, and evaluation needed for sufficient development of these technologies to allow for

technology transfer and application to D and D and waste management (WM) activities. It is essential that follow-on engineering studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in the TLD and by finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk. This report consists of the decontamination, robotics/automation, and WM data sheets.

2294 Tantalum-base materials for molten plutonium containment. Gdowski, G.E. (Lawrence Livermore National Lab., CA (United States)); Bronson, M.C.; Dodson, K.E. pp. 57-63 of *Actinide processing: Methods and materials*. Mishra, B. (ed.); Averill, W.A. (ed.). The Minerals, Metals and Materials Society, Warrendale, PA (United States) (1994). pp. 408 (CONF-940204-: 123. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994).

The operating conditions for the pyrochemical processing of plutonium severely restricts the materials choices for the process components. Pure tantalum has many desirable properties as a construction material; it has a high melting point and low solubility in molten plutonium at processing temperatures. However, it has limitations because it is susceptible to intergranular attack and is wetted by molten plutonium. Tantalum-carbon base materials have been developed to overcome the limitations of pure tantalum. Different materials are used depending on the requirements of the operating conditions. Carbide coated tantalum is used for components, such as stirrers, that do not remain in contact with significant amounts of solidifying material. A tantalum-carbon base alloy has been developed for components, such as crucibles, that are in contact with solidifying plutonium.

2295 Risk assessment data needs for D&D of the Fernald production area. Avci, H.I. (Argonne National Lab., IL (United States)); Davis, M.J.; Dalga, D.G.; Janke, R.J. *Transactions of the American Nuclear Society (United States)*; 69: 41-42 (1993). (CONF-931160-: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

The production area at the Fernald Environmental Management Project (FEMP), located ~18 miles northwest of Cincinnati, Ohio, was used to process uranium ore and ore concentrates to produce high-purity uranium metal for the U.S. Department of Energy (DOE) and its predecessor agencies from 1952 until 1989. Thorium was also produced on a smaller scale. The site was placed on the National Priorities List in 1989 and is currently undergoing remediation in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended. This paper discusses the data needed to carry out the risk assessment required to support the decontamination and decommissioning of the former production area. An overview of the risk assessment methodology is also included.

2296 Dust resuspension from soil in a semi-arid environment at the Nevada Test Site. Eckart, R. (Univ. of Cincinnati, OH (United States)); Chen, H. *Transactions of the American Nuclear Society (United States)*; 69: 46-49 (1993). (CONF-931160-: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

The resuspension and transport of contaminated dust at an arid and/or semi-arid site create a major source of exposure to people who use the site and to off-site populations. At the Nevada Test Site (NTS), a preliminary base-line risk assessment conducted by the University of Cincinnati indicated that ~90% of the annual effective dose equivalent is derived from inhalation of contaminated dust. Despite the importance of this pathway, very few models exist to predict the resuspension of the soil from the desert pavement. There are no good models to predict the resuspension of soil after soil cleaning or site restoration. There are three types of resuspension processes: (1) wind-related resuspension/suspension; (2) mechanical resuspension/suspension; and (3) local resuspension or suspension. Mechanical and local resuspension originate from mechanical disturbance of the soil. This paper discusses the analysis of wind-related resuspension based on physical principles and examines revegetation or mulching of the cleansed soil.

2297 Application of quantitative uncertainty analysis for human health risk assessment at Rocky Flats. Duncan, F.L.W. (Dames & Moore, Denver, CO (United States)); Gordon, J.W.; Smith, D.; Singh, S.P. *Transactions of the American Nuclear Society (United States)*; 69: 49-50 (1993). (CONF-931160—: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

The characterization of uncertainty is an important component of the risk assessment process. According to the U.S. Environmental Protection Agency's (EPA's) "Guidance on Risk Characterization for Risk Managers and Risk Assessors," point estimates of risk "do not fully convey the range of information considered and used in developing the assessment." Furthermore, the guidance states that the Monte Carlo simulation may be used to estimate descriptive risk percentiles. To provide information about the uncertainties associated with the reasonable maximum exposure (RME) estimate and the relation of the RME to other percentiles of the risk distribution for Operable Unit 1 (OU-1) at Rocky Flats, uncertainties were identified and quantitatively evaluated. Monte Carlo simulation is a technique that can be used to provide a probability function of estimated risk using random values of exposure factors and toxicity values in an exposure scenario. The Monte Carlo simulation involves assigning a joint probability distribution to the input variables (i.e., exposure factors) of an exposure scenario. Next, a large number of independent samples from the assigned joint distribution are taken and the corresponding outputs calculated. Methods of statistical inference are used to estimate, from the output sample, some parameters of the output distribution, such as percentiles and the expected value.

2298 Remote automatic control scheme for plasma arc cutting of contaminated waste. Dudar, A.M. (Westinghouse Savannah River Co., Aiken, SC (United States)); Ward, C.R.; Krikkku, E.M. *Transactions of the American Nuclear Society (United States)*; 69: 491-492 (1993). (CONF-931160—: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993).

Plasma arc cutting is a popular technique used for size reduction of radioactively contaminated metallic waste such as glove boxes, vessels, and ducts. It is a very aggressive process and is capable of cutting metal objects up to 3 in. thick. The crucial control criteria in plasma cutting is maintaining a "stand-off" distance between the plasma torch tip and the

material being cut. Manual plasma cutting techniques in radioactive environments require the operator to wear a plastic suit covered by a metallic suit. This is very cumbersome, time-consuming, and also generates additional waste (plastic and metallic suits). Teleoperated remote cutting is preferable to manual cutting, but our experience has shown that remote control of the stand-off distance is particularly difficult because of the brightness of the plasma arc and inadequate viewing angles. Also, the heat generated by the torch causes the sheet metal to deform and warp during plasma cutting, creating a dynamically changing metal surface. The aforementioned factors make it extremely difficult, if not impossible, to perform plasma cuts of waste with a variety of shapes and sizes in a teleoperated fashion with an operator in the loop. Automating the process is clearly desirable.

ROBOTICS

Refer also to citation(s) 405, 628, 923, 1006, 1101, 1848, 1858

2299 (CONF-930873—, pp. 8.3.1-8.3.7) The standard laboratory module approach to automation of the chemical laboratory. Hollen, R.M. (Los Alamos National Lab., NM (United States)); Erkkila, T.H. American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

Automation of the technology and practice of environmental laboratory automation has not been as rapid or complete as one might expect. Confined to autosamplers and limited robotic systems, our ability to apply production concepts to environmental analytical analysis is not great. With the impending remediation of our hazardous waste sites in the US, only the application of production chemistry techniques will even begin to provide those responsible with the necessary knowledge to accomplish the cleanup expeditiously and safely. Tightening regulatory requirements have already mandated staggering increases in sampling and characterization needs with the future only guaranteeing greater demands. The Contaminant Analysis Automation Program has been initiated by our government to address these current and future characterization by application of a new robotic paradigm for analytical chemistry. By using standardized modular instruments, named Standard Laboratory Modules, flexible automation systems can rapidly be configured to apply production techniques to our nations environmental problems at-site.

2300 (CONF-9310355-1) Input shaping methods for telerobotic operation of flexible, long-reach manipulators. Kwon, Dong-Soo; Hwang, Dong-Hwan; Babcock, S.M. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00033. From Teleoperation '93 conference; New York, NY (United States); 19-21 Oct 1993. Order Number DE94018972. Source: OSTI; NTIS; INIS; GPO Dep.

Among the Environmental Restoration and Waste Management Program of the U.S. Department of Energy, the

remediation of radioactive waste from the underground storage tank challenges the state-of-the-art equipment and methods. Long-reach manipulators are being considered to be one of the most advantageous approaches for the retrieval of waste from large storage tanks. Because of long-reach manipulator's high payload capacity and high length-to-cross-section ratios, such manipulator system exhibits significant structural flexibility. To avoid structural vibrations during operation, control algorithms employing various types of shaping filters were investigated. A robust notch filtering method and an impulse shaping method were evaluated. In addition to that, a new approach that uses imbedded simulation was developed and compared with others. In the new approach, joint trajectories have been generated considering the flexible link dynamics.

2301 (CONF-9310358-1) Telerobotic operation of structurally flexible, long-reach manipulators. Kwon, D.S.; Hwang, D.H.; Babcock, S.M. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Korea automatic control conference; Seoul (Korea, Republic of); 20-22 Oct 1993. Order Number DE94018971. Source: OSTI; NTIS; INIS; GPO Dep.

As a part of the Department of Energy's Environmental Restoration and Waste Management Program, long-reach manipulators are being considered for the retrieval of waste from large storage tanks. Long-reach manipulators may have characteristics significantly different from those of typical industrial robots because of the flexibility of long links needed to cover the large workspace. To avoid structural vibrations during operation, control algorithms employing various types of shaping filters were investigated. A new approach that uses embedded simulation was developed and compared with others. In the new approach, generation of joint trajectories considering link flexibility was also investigated.

2302 (CONF-940550-14) A quick telemanipulator calibration and repeatability method with applications. Jansen, J.F. (Oak Ridge National Lab., TN (United States). Robotics & Process Systems Div.); Haley, D.C. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics; San Diego, CA (United States); 8-13 May 1994. Order Number DE94018710. Source: OSTI; NTIS; GPO Dep.

This paper will present a methodology that was used to calibrate and measure the repeatability of two telemanipulators at Oak Ridge National Laboratory. The global accuracy of the method was 0.05 in. (≈ 1.3 mm), and the orientation accuracy was approximately 6 min (≈ 0.002 rads). For most teleoperator systems, these accuracies are more than adequate because of the construction of the mechanism and sensor capabilities (e.g., typically 12 bits of resolution). Although industrial robots require accuracies of about 0.05 mm or better, telemanipulators do not.

2303 Monitored Retrievable Storage/multi-purpose canister analysis: Simulation and economics of automation. Bennett, P.C. (Sandia National Labs., Albuquerque, NM (United States)); Stringer, J.B. pp. 363-369 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 DOE Contract AC04-76DP00789. From

International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

Robotic automation is examined as a possible alternative to manual spent nuclear fuel, transport cask and Multi-Purpose Canister (MPC) handling at a Monitored Retrievable Storage (MRS) facility. Automation of key operational aspects for the MRS/MPC system are analyzed to determine equipment requirements, through-put times and equipment costs is described. The economic and radiation dose impacts resulting from this automation are compared to manual handling methods.

2304 (CONF-940859-19) Experimental implementation of a robust damped-oscillation control algorithm on a full-sized, two-degree-of-freedom, AC induction motor-driven crane. Kress, R.L.; Jansen, J.F.; Noakes, M.W. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. international symposium on robotics and manufacturing; Maui, HI (United States); 14-18 Aug 1994. Order Number DE94012113. Source: OSTI; NTIS; INIS; GPO Dep.

When suspended payloads are moved with an overhead crane, pendulum like oscillations are naturally introduced. This presents a problem any time a crane is used, especially when expensive and/or delicate objects are moved, when moving in a cluttered and/or hazardous environment, and when objects are to be placed in tight locations. Damped-oscillation control algorithms have been demonstrated over the past several years for laboratory-scale robotic systems on dc motor-driven overhead cranes. Most overhead cranes presently in use in industry are driven by ac induction motors; consequently, Oak Ridge National Laboratory has implemented damped-oscillation crane control on one of its existing facility ac induction motor-driven overhead cranes. The purpose of this test was to determine feasibility, to work out control and interfacing specifications, and to establish the capability of newly available ac motor control hardware with respect to use in damped-oscillation-controlled systems. Flux vector inverter drives are used to investigate their acceptability for damped-oscillation crane control. The purpose of this paper is to describe the experimental implementation of a control algorithm on a full-sized, two-degree-of-freedom, industrial crane; describe the experimental evaluation of the controller including robustness to payload length changes; explain the results of experiments designed to determine the hardware required for implementation of the control algorithms; and to provide a theoretical description of the controller.

2305 (CONF-940859-20) Advanced robotics for decontamination and dismantlement. Hamel, W.R.; Haley, D.C. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. international symposium on robotics and manufacturing; Maui, HI (United States); 14-18 Aug 1994. Order Number DE94012663. Source: OSTI; NTIS; INIS; GPO Dep.

The decontamination and dismantlement (D&D) robotics technology application area of the US Department of Energy's Robotics Technology Development Program is explained and described. D&D robotic systems show real promise for the reduction of human exposure to hazards, for improvement of productivity, and for the reduction of secondary waste generation. Current research and development pertaining to automated floor characterization, robotic equipment removal, and special inspection is summarized.

Future research directions for these and emerging activities is given.

2306 (CONF-950232-10) Requirements and design concept for a facility mapping system. Barry, R.E. (Oak Ridge National Lab., TN (United States)); Burks, B.L.; Little, C.Q. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95007379. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has for some time been considering the Decontamination and Dismantlement (D&D) of facilities which are no longer in use, but which are highly contaminated with radioactive wastes. One of the holdups in performing the D&D task is the accumulation of accurate facility characterizations that can enable a safe and orderly cleanup process. According to the Technical Strategic Plan for the Decontamination and Decommissioning Integrated Demonstration, "the cost of characterization using current baseline technologies for approximately 100 acres of gaseous diffusion plant at Oak Ridge alone is, for the most part incalculable". Automated, robotic techniques will be necessary for initial characterization and continued surveillance of these types of sites. Robotic systems are being designed and constructed to accomplish these tasks. This paper describes requirements and design concepts for a system to accurately map a facility contaminated with hazardous wastes. Some of the technologies involved in the Facility Mapping System are: remote characterization with teleoperated, sensor-based systems, fusion of data sets from multiple characterization systems, and object recognition from 3D data models. This Facility Mapping System is being assembled by Oak Ridge National Laboratory for the DOE Office of Technology Development Robotics Technology Development Program.

2307 (CONF-950232-20) Application of the selective equipment removal system to D&D tasks. Noakes, M.W.; Hamel, W.R.; Dixon, W.E. Oak Ridge National Lab., TN (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95007369. Source: OSTI; NTIS; INIS; GPO Dep.

The Selective Equipment Removal System has been designed as a generic and reconfigurable remote manipulation platform to demonstrate and evaluate mobile telerobotic concepts suitable for performing selective decontamination and dismantlement functions. Both radioactive and hazardous chemical environments dictate that human presence should be minimized in many of these activities. In addition, robotic deployment of large and heavy tools should improve safety of operation by limiting human proximity to tooling. Monotonous, repetitive, and high precision activities should also benefit by robotic completion. This paper discusses the development of the Selective Equipment Retrieval System and its remote manipulation platform, the Dual Arm Work Module, applicable tooling, and application to various decontamination and dismantlement tasks.

2308 (CONF-950232-21) Simulation analysis of control strategies for a tank waste retrieval manipulator system. Schryver, J.C.; Draper, J.V. Oak Ridge National Lab., TN (United States); Human Machine Interfaces, Inc.,

Knoxville, TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-86ER80403. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95007035. Source: OSTI; NTIS; INIS; GPO Dep.

A network simulation model was developed for the Tank Waste Retrieval Manipulator System, incorporating two distinct levels of control: teleoperation and supervisory control. The model included six error modes, an attentional resource model, and a battery of timing variables. A survey questionnaire administered to subject matter experts provided data for estimating timing distributions for level of control-critical tasks. Simulation studies were performed to evaluate system behavior as a function of control level and error modes. The results provide important insights for development of waste retrieval manipulators.

2309 (CONF-950232-26) Simulation of robot manipulators. Kress, R.L.; Babcock, S.M.; Bills, K.C.; Kwon, D.S.; Schoenwald, D.A. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95008680. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes Oak Ridge National Laboratory's development of an environment for the simulation of robotic manipulators. Simulation includes the modeling of kinematics, dynamics, sensors, actuators, control systems, operators, and environments. Models will be used for manipulator design, proposal evaluation, control system design and analysis, graphical preview of proposed motions, safety system development, and training. Of particular interest is the development of models for robotic manipulators having at least one flexible link. As a first application, models have been developed for the Pacific Northwest Laboratories' Flexible Beam Testbed which is a one-Degree-Of-Freedom, flexible arm with a hydraulic base actuator. Initial results show good agreement between model and experiment.

2310 (CONF-950232-27) Design and experimental evaluation of flexible manipulator control algorithms. Kwon, D.S. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Hwang, D.H.; Babcock, S.M.; Kress, R.L.; Lew, J.Y.; Evans, M.S. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95008684. Source: OSTI; NTIS; INIS; GPO Dep.

Within the Environmental Restoration and Waste Management Program of the US Department of Energy, the remediation of single-shell radioactive waste storage tanks is one of the areas that challenge state-of-the-art equipment and methods. The use of long-reach manipulators is being seriously considered for this task. Because of high payload capacity and high length-to-cross-section ratio requirements, these long-reach manipulator systems are expected to use hydraulic actuators and to exhibit significant structural flexibility. The controller has been designed to compensate for the hydraulic actuator dynamics by using a load-compensated velocity feedforward loop and to increase the bandwidth by using an inner pressure feedback loop. Shaping filter techniques have been applied as feedforward

controllers to avoid structural vibrations during operation. Various types of shaping filter methods have been investigated. Among them, a new approach, referred to as a "feedforward simulation filter" that uses embedded simulation, has been presented.

2311 (CONF-950232-28) **A Mobile Automated Characterization System (MACS) for indoor floor characterization.** Richardson, B.S. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Haley, D.C.; Dudar, A.M.; Ward, C.R. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95008679. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Technology Center (SRTC) and Oak Ridge National Laboratory are developing an advanced Mobile Automated Characterization System (MACS) to characterize indoor contaminated floors. MACS is based upon Semi-Intelligent Mobile Observing Navigator (SIMON), an earlier floor characterization system developed at SRTC. MACS will feature enhanced navigation systems, operator interface, and an interface to simplify integration of additional sensors. The enhanced navigation system will provide the capability to survey large open areas much more accurately than is now possible with SIMON, which is better suited for hallways and corridors that provide the means for recalibrating position and heading. MACS operator interface is designed to facilitate MACS's use as a tool for health physicists, thus eliminating the need for additional training in the robot's control language. Initial implementation of MACS will use radiation detectors. Additional sensors, such as PCB sensors currently being developed, will be integrated on MACS in the future. Initial use of MACS will be focused toward obtaining comparative results with manual methods. Surveys will be conducted both manually and with MACS to compare relative costs and data quality. While clear cost benefits anticipated, data quality benefits should be even more significant.

2312 (CONF-950232-31) **Test bed control center design concept for Tank Waste Retrieval Manipulator Systems.** Sundstrom, E. (Human Machine Interfaces, Inc., Knoxville, TN (United States)); Draper, J.V.; Fausz, A. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95006391. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the design concept for the control center for the Single Shell Tank Waste Retrieval Manipulator System test bed and the design process behind the concept. The design concept supports all phases of the test bed mission, including technology demonstration, comprehensive system testing, and comparative evaluation for further development and refinement of the TWRMS for field operations.

2313 (CONF-9505193-2) **Tracking control of the hydraulically actuated flexible manipulator.** Kwon, D.S.; Babcock, S.M.; Burks, B.L.; Kress, R.L. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1995 international conference on robotics

and automation; Nagoya (Japan); 21-27 May 1995. Order Number DE95008683. Source: OSTI; NTIS; INIS; GPO Dep.

The remediation of single-shell radioactive waste storage tanks is one of the urgent tasks of the Department of Energy that challenge state-of-the-art equipment and methods. The use of long-reach manipulators is being seriously considered for this remediation task. Because high payload capacity and high length-to-cross-section ratio requirements, these long-reach manipulator systems are expected to use hydraulic actuators and to exhibit significant structural flexibility. The controller has been designed to compensate for the hydraulic actuator dynamics by using a load-compensated velocity feedforward loop and to increase the bandwidth by using a pressure feed backloop. Shaping filter techniques have been applied as a feedforward controller to avoid structural vibrations during operation. Among various types of shaping filter methods investigated an approach, referred to as a "feedforward simulation filter" that uses embedded simulation, has been presented.

2314 (DOE/MC/29104-95/C0411) **Sensor-based interior modeling.** Herbert, M.; Hoffman, R.; Johnson, A.; Osborn, J. Carnegie-Mellon Univ., Pittsburgh, PA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29104. (CONF-950232-16: 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995). Order Number DE95007349. Source: OSTI; NTIS; INIS; GPO Dep.

Robots and remote systems will play crucial roles in future decontamination and decommissioning (D&D) of nuclear facilities. Many of these facilities, such as uranium enrichment plants, weapons assembly plants, research and production reactors, and fuel recycling facilities, are dormant; there is also an increasing number of commercial reactors whose useful lifetime is nearly over. To reduce worker exposure to radiation, occupational and other hazards associated with D&D tasks, robots will execute much of the work agenda. Traditional teleoperated systems rely on human understanding (based on information gathered by remote viewing cameras) of the work environment to safely control the remote equipment. However, removing the operator from the work site substantially reduces his efficiency and effectiveness. To approach the productivity of a human worker, tasks will be performed telerobotically, in which many aspects of task execution are delegated to robot controllers and other software. This paper describes a system that semi-automatically builds a virtual world for remote D&D operations by constructing 3-D models of a robot's work environment. Planar and quadric surface representations of objects typically found in nuclear facilities are generated from laser rangefinder data with a minimum of human interaction. The surface representations are then incorporated into a task space model that can be viewed and analyzed by the operator, accessed by motion planning and robot safeguarding algorithms, and ultimately used by the operator to instruct the robot at a level much higher than teleoperation.

2315 (DOE/MC/29104-95/C0436) **Rosie: A mobile workstation for decontamination and dismantlement operations.** Carnegie-Mellon Univ., Pittsburgh, PA (United States); Redzone Robotics, Inc., Pittsburgh, PA (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29104. (CONF-9411149-8: Opportunity 95: environmental technology through small business, Morgantown, WV (United

States), 16-17 Nov 1994). Order Number DE95007565. Source: OSTI; NTIS; INIS; GPO Dep.

RedZone Robotics, Inc. and Carnegie Mellon University's Field Robotics Center have undertaken a contract to develop a next-generation worksystem for decommissioning and dismantlement tasks in Department of Energy (DOE) facilities. Currently, the authors are in the second phase of this three phase effort and are completing the design of the worksystem. Within this project RedZone is designing and fabricating a worksystem: Rosie. Rosie will include a locomotor, heavy manipulator, control center, and control system for robot operation. The locomotor is an omni-directional platform with tether management and hydraulic power capabilities. The heavy manipulator is a high-payload, long-reach system to deploy tools into the work area. The heavy manipulator will be capable of deploying systems such as the Dual-Arm Work Module—a five degree-of-freedom platform supporting two highly dexterous manipulators—or a single manipulator for performing simpler, less dexterous tasks. Rosie will be telerobotic to the point of having servo-controlled motions which can be operated and coordinated through the control center. This report describes the design of the systems. In phase three Rosie will be radiation-hardened and perform a demonstration in a contaminated facility.

2316 (DOE/MC/29104-3662) Mobile workstation for decontamination and decommissioning operations. Whittaker, W.L. (Carnegie-Mellon Univ., Pittsburgh, PA (United States). Robotics Inst.); Osborn, J.F.; Thompson, B.R. Carnegie-Mellon Univ., Pittsburgh, PA (United States). Robotics Inst.; Redzone Robotics, Inc., Pittsburgh, PA (United States). Oct 1993. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29104, Order Number DE94004079. Source: OSTI; NTIS; INIS; GPO Dep.

This project is an interdisciplinary effort to develop effective mobile worksystems for decontamination and decommissioning (D&D) of facilities within the DOE Nuclear Weapons Complex. These mobile worksystems will be configured to operate within the environmental and logistical constraints of such facilities and to perform a number of work tasks. Our program is designed to produce a mobile worksystem with capabilities and features that are matched to the particular needs of D&D work by evolving the design through a series of technological developments, performance tests and evaluations. The project has three phases. In this the first phase, an existing teleoperated worksystem, the Remote Work Vehicle (developed for use in the Three Mile Island Unit 2 Reactor Building basement), was enhanced for telerobotic performance of several D&D operations. Its ability to perform these operations was then assessed through a series of tests in a mockup facility that contained generic structures and equipment similar to those that D&D work machines will encounter in DOE facilities. Building upon the knowledge gained through those tests and evaluations, a next generation mobile worksystem, the RWV II, and a more advanced controller will be designed, integrated and tested in the second phase, which is scheduled for completion in January 1995. The third phase of the project will involve testing of the RWV II in the real DOE facility.

2317 (DOE/MC/29113-95/C0437) Interactive computer enhanced remote viewing system. Smith, D.A.; Tourtellott, J.A. Mechanical Technology, Inc., Latham, NY (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC21-92MC29113. (CONF-9411149-17: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007638. Source: OSTI; NTIS; INIS; GPO Dep.

The Interactive, Computer Enhanced, Remote Viewing System (ICERVSA) is a volumetric data system designed to help the Department of Energy (DOE) improve remote operations in hazardous sites by providing reliable and accurate maps of task spaces where robots will clean up nuclear wastes. The ICERVS mission is to acquire, store, integrate and manage all the sensor data for a site and to provide the necessary tools to facilitate its visualization and interpretation. Empirical sensor data enters through the Common Interface for Sensors and after initial processing, is stored in the Volumetric Database. The data can be analyzed and displayed via a Graphic User Interface with a variety of visualization tools. Other tools permit the construction of geometric objects, such as wire frame models, to represent objects which the operator may recognize in the live TV image. A computer image can be generated that matches the viewpoint of the live TV camera at the remote site, facilitating access to site data. Lastly, the data can be gathered, processed, and transmitted in acceptable form to a robotic controller. Descriptions are given of all these components. The final phase of the ICERVS project, which has just begun, will produce a full scale system and demonstrate it at a DOE site to be selected. A task added to this Phase will adapt the ICERVS to meet the needs of the Dismantlement and Decommissioning (D and D) work at the Oak Ridge National Laboratory (ORNL).

2318 (DOE/MC/29113-3766-Pt.1) Integrated Computer-Enhanced Remote Viewing System: Quarterly report No. 6, January 1994-March 1994. Mechanical Technology, Inc., Latham, NY (United States). 25 Apr 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE94013208. Source: OSTI; NTIS; GPO Dep.

The Interactive, Computer-Enhanced, Remote Viewing System (ICERVS) is a system designed to provide a reliable geometric description of a robotic task space in a fashion that enables robotic remediation to be carried out more efficiently and economically than with present systems. The key elements are a faithful way to store empirical data and a friendly user interface that provides an operator with timely access to all that is known about a scene. ICERVS will help an operator to analyze a scene and generate additional geometric data for automating significant portions of the remediation activity. Features that enable this include the following: Storage and display of empirical sensor data; Ability to update segments of the geometric description of the task space; Side-by-side comparisons of a live TV scene and a computer generated view of the same scene; Ability to create and display computer models of perceived objects in the task space, together with textural comments; and Easy export of data to robotic world models for robot guidance.

2319 (DOE/MC/29113-3766-Pt.2) Interactive Computer-Enhanced Remote Viewing System (ICERVS): Subsystem design report - Phase 2. Smith, D.A. Mechanical Technology, Inc., Latham, NY (United States). 22 Apr 1994. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE94014513. Source: OSTI; NTIS; GPO Dep.

This ICERVS Phase II Subsystem Design Report describes the detailed software design of the Phase II Interactive Computer-Enhanced Remote Viewing System

(ICERVS). ICERVS is a computer-based system that provides data acquisition, data visualization, data analysis, and model synthesis to support robotic remediation of hazardous environments. Due to the risks associated with hazardous environments, remediation must be conducted remotely using robotic systems, which, in turn, must rely on 3D models of their workspace to support both task and path planning with collision avoidance. Tools such as ICERVS are vital to accomplish remediation tasks in a safe, efficient manner. The 3D models used by robotic systems are based on solid modeling methods, in which objects are represented by enclosing surfaces (polygons, quadric surfaces, patches, etc.) or collections of primitive solids (cubes, cylinders, etc.). In general, these 3D models must be created and/or verified by actual measurements made in the robotics workspace. However, measurement data is empirical in nature, with typical output being a collection of xyz triplets that represent sample points on some surface(s) in the workspace. As such, empirical data cannot be readily analyzed in terms of geometric representations used in robotic workspace models. The primary objective of ICERVS is to provide a reliable description of a workspace based on dimensional measurement data and to convert that description into 3D models that can be used by robotic systems. ICERVS will thus serve as a critical factor to allow robotic remediation tasks to be performed more effectively (faster, safer) and economically than with present systems.

2320 (DOE/MC/29113-3912) Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April-June, 1994. Mechanical Technology, Inc., Latham, NY (United States). 1 Aug 1994. 224p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE95001479. Source: OSTI; NTIS; GPO Dep.

The Interactive, Computer-Enhanced, Remote Viewing System (ICERVS) is a system designed to provide a reliable geometric description of a robotic task space in a fashion that enables robotic remediation to be carried out more efficiently and economically than with present systems. The key elements are a faithful way to store empirical data and a friendly user interface that provides an operator with timely access to all that is known about a scene. ICERVS will help an operator to analyze a scene and generate additional geometric data for automating significant portions of the remediation activity. The development of ICERVS is to occur in three phases. The development of ICERVS is to occur in three phases. Phase 1 will focus on the development of the Data Library, which contains the geometric data about the task space and the objects in it, and the Toolkit, which includes the mechanisms for manipulating and displaying both empirical and model data. Phase 2 will concentrate on integrating these subsystems with a sensor subsystem into one working system. Some additional functionality will be incorporated in the Data Library and Toolkit subsystems. Phase 3 will expand the configuration to meet the needs of a full scale demonstration of the interactive mapping of some waste site to be identified. The second Phase of the ICERVS project consists of nine tasks which are described in Attachment A. This listing includes the eight tasks originally proposed together with an additional task to supply a working copy of ICERVS to INEL for use with the Buried Waste Integrated Demonstration (BWID). ICERVS software implementation is almost complete and integration of the ICERVS Phase 2 software has begun.

2321 (DOE/MC/29115-95/C0403) ARIES: A mobile robot inspector. Byrd, J.S. South Carolina Univ., Columbia, SC (United States). Dept. of Electrical and Computer Engineering. [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29115. (CONF-950232-7: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95001589. Source: OSTI; NTIS; INIS; GPO Dep.

ARIES (Autonomous Robotic Inspection Experimental System) is a mobile robot inspection system being developed for the Department of Energy (DOE) to survey and inspect drums containing mixed and low-level radioactive waste stored in warehouses at DOE facilities. The drums are typically stacked four high and arranged in rows with three-foot aisle widths. The robot will navigate through the aisles and perform an autonomous inspection operation, typically performed by a human operator. It will make real-time decisions about the condition of the drums, maintain a database of pertinent information about each drum, and generate reports.

2322 (DOE/MC/29115-95/C0415) An intelligent inspection and survey robot. Byrd, J.; Holland, J.M. South Carolina Universities Research, Clemson, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29115. (CONF-9411149-1: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007348. Source: OSTI; NTIS; INIS; GPO Dep.

ARIES (Autonomous Robotic Inspection Experimental System) is a semi-autonomous robotic system intended for use in the automatic inspection of stored containers of low level nuclear waste. The project is being performed by a team under the SCUREF (South Carolina University Research and Education Foundation) comprised of the University of South Carolina, and Clemson University, and their industrial partner Cybermotion Inc., with funding from METC, Morgantown, WV. The ARIES program is unusual in the level of cooperation between the universities and Cybermotion. By maintaining daily communications via telephone and E-Mail, participating in frequent meetings with each other and the end users, and by developing an open flow of (sometimes sensitive) technical information, the team has been able to build on a very broad base of intellectual strengths and existing technology without wasteful duplication. This base includes all of the navigation and control software and hardware developed by Cybermotion over nearly a decade and the deep technology resources of the university partners. It is anticipated that the result will be a technically advanced system that is much closer to a deployable configuration than is typical for this stage of research. In this decade of shrinking budgets, such relationships can provide a crucial advantage for all participants.

2323 (DOE/MC/30173-95/C0414) Waste inspection tomography (WIT). Bernardi, R.T.; Han, K.S. Bio-Imaging Research, Inc., Lincolnshire, IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30173. (CONF-9411149-18: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007971. Source: OSTI; NTIS; INIS; GPO Dep.

The WIT program will provide an inspection system that offers the nuclear waste evaluator a unique combination of

tools for regulatory-driven characterization of low-level waste (LLW), transuranic waste (TRU), and mixed waste drums. WIT provides nondestructive, noninvasive, and environmentally safe inspections using X-ray and gamma ray technologies, with reasonable cost and throughput. Two emission imaging techniques will be employed for characterizing materials in waste containers. The first of these is gamma emission tomography, commonly called single-photon emission computed tomography (SPECT). Rather than using an external radiation source, SPECT uses the emission of radioactive materials within the object of interest for imaging. In this case, emission from actual nuclear waste within a container will provide a three-dimensional image of the radioactive substances in the container. The second emission technique will use high-purity germanium detectors for gamma ray spectroscopy. This technique, called nondestructive assay (NDA), can identify the emitting isotopic species and strength. Work in emission tomography and assay of nuclear waste has been undertaken at Lawrence Livermore National Laboratory using a technique called Passive Tomography. Results from a process development unit are presented.

2324 (DOE/MC/30362-95/C0405) BOA: Pipe-asbestos insulation removal robot system. Schempf, H. (and others); Bares, J.; Mutschler, E. Carnegie-Mellon Univ., Pittsburgh, PA (United States). Robotics Inst. [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30362. (CONF-950232-6: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95001590. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the BOA system, a mobile pipe-external crawler used to remotely strip and bag (possibly contaminated) asbestos-containing lagging and insulation materials (ACLIM) from various diameter pipes in (primarily) industrial installations across the DOE weapons complex. The mechanical removal of ACLIM is very cost-effective due to the relatively low productivity and high cost involved in human removal scenarios. BOA, a mechanical system capable of removing most forms of lagging (paper, plaster, aluminum sheet, clamps, screws and chicken-wire), and insulation (paper, tar, asbestos fiber, mag-block) uses a circular cutter and compression paddles to cut and strip the insulation off the pipe through compression, while a HEPA-filter and encapsulant system maintain a certifiable vacuum and moisture content inside the system and on the pipe, respectively. The crawler system has been built and is currently undergoing testing. Key design parameters and performance parameters are developed and used in performance testing. Since the current system is a testbed, we also discuss future enhancements and outline two deployment scenarios (robotic and manual) for the final system to be designed and completed by the end of FY '95. An on-site demonstration is currently planned for Fernald in Ohio and Oak Ridge in Tennessee.

2325 (EGG-M-94023) T-Rex system for operation in TRU, LLW, and hazardous zones. Kline, H.M. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Andreycheck, T.P.; Beeson, B.K. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940225-128: Waste management '94: working towards a cleaner environment, Tucson,

AZ (United States), 27 Feb - 3 mar 1994). Order Number DE95005035. Source: OSTI; NTIS; INIS; GPO Dep.

T-Rex stands for Transuranic Storage Area Remote Excavator that is dedicated to the retrieval of above ground waste containers and overburden at the Radioactive Waste Management Complex (RWMC) located at the Idaho National Engineering Laboratory. There are a number of sites around the world containing (transuranic) (TRU), low level (LLW), and hazardous wastes that requires teleoperated, heavy lift manipulators with long reach and high precision to handle the materials stored there. Remote operation of equipment will reduce the risk to personnel to as-low-as-reasonably-achievable (ALARA) levels. The T-Rex is designed to fulfill this requirement at relatively low cost through the integration of a production front shovel excavator with a control system, local and remote operator control stations, a closed-circuit television system (CCTV), and multiple end effectors with quick changeout capability. This paper describes the conversion of an off-the-shelf excavator to a machine utilizing a modified hydraulic system, an integrated onboard remote control system, CCTV system, collision avoidance system, and a remote control station.

2326 (EGG-WTD-11446) Buried waste integrated demonstration human engineered control station. Final report. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 286p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95004997. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Human Engineered Control Station (HECS) project activities including the conceptual designs. The purpose of the HECS is to enhance the effectiveness and efficiency of remote retrieval by providing an integrated remote control station. The HECS integrates human capabilities, limitations, and expectations into the design to reduce the potential for human error, provides an easy system to learn and operate, provides an increased productivity, and reduces the ultimate investment in training. The overall HECS consists of the technology interface stations, supporting engineering aids, platform (trailer), communications network (broadband system), and collision avoidance system.

2327 (LA-UR-94-930) Robotic automation of the environmental chemical laboratory. Hollen, R.M.; Erkkila, T.H. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940859-15: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94009361. Source: OSTI; NTIS; GPO Dep.

To date, automation of the environmental chemical laboratory has been a slow and tedious affair. In many, of our domestic analytical laboratories, automation consists of no more than analytical instrumentation coupled to an autosampling device. When we look into the future environmental needs of our nation, and indeed the world, it is apparent that we will not be able to keep up with the drastically increasing sample load without automated analyses. Stricter regulatory requirements on the horizon will potentially mandate staggering changes in sampling and characterization requirements. The Contaminant Analysis Automation (CAA) Program was initiated in 1990 by the US government's Department of Energy (DOE) to address these issues. By application of a new robotics paradigm, based on an integrated production chemistry foundation applied to analytical

chemistry, the CAA will use standardized modular instruments called Standard Laboratory Modules (SLM) to provide flexible and standardized automation systems. By promoting the commercialization of this technology, CAA will provide the integrated robotics systems necessary to meet the coming remediation demands. This multilaboratory program is within the Robotics Technology Development Program (RTDP) of the Office of Technology Development (OTD).

2328 (ORNL/TM-12710) A review of the environmental survivability of telerobotic control sensor systems for use in nuclear waste tanks. Holcomb, D.E.; Burks, B.L. Oak Ridge National Lab., TN (United States). May 1994. 573p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94015635. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared by the Oak Ridge National Laboratory (ORNL) and funded by the Department of Energy (DOE) Office of Technology Development (OTD) Robotics Technology Development Program (RTDP). During the next few years field deployment of remotely operated systems in nuclear waste cleanup operations will increase dramatically as DOE strives to efficiently and safely remediate the many waste storage sites. Typically, the most fragile components in remote systems are the sensors that provide feedback to the operators or to computer control algorithms. The purpose of this review is to determine the availability of environmentally hardened sensors to support control of a manipulator or vehicle system in a waste tank environment. The emphasis of the report is on the environmental ruggedness of currently available sensors. For the purpose of this review a set of nominal requirements for survivability were adopted conditions in the single-shell tanks at Hanford. This report is designed to be a practical guide to the state of the art in commercially available environmentally tolerant sensors for use with robotic systems. It is neither intended to be an exhaustive review of the technical literature on potential measurement techniques nor a complete physical review of the functioning of particular sensor systems. This report is intended to be a living document. As additional, corrected, or updated information is received from sensor manufacturers, it will be incorporated into the report database. The physical report will then be periodically revised and released in updated format. The authors wish to apologize to any sources of environmentally hardened sensors that were omitted during this review and encourage submission of new or updated data.

2329 (ORNL/TM-12714) Feasibility study and concepts for use of compact process units to treat Hanford tank wastes. Collins, E.D.; Bond, W.D.; Campbell, D.O.; Harrington, F.E.; Malkemus, D.W.; Peishel, F.L.; Yarbrow, O.O. Oak Ridge National Lab., TN (United States). Jun 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94013196. Source: OSTI; NTIS; INIS; GPO Dep.

A team of experienced radiochemical design engineers and chemists was assembled at Oak Ridge National Laboratory (ORNL) at the request of the Underground Storage Tank Integrated Demonstration (USTID) Program to evaluate the feasibility and perform a conceptual study of options for the use of compact processing units (CPUs), located at the Hanford, Washington, waste tank sites, to accomplish extensive pretreatment of the tank wastes using the clean-option concept. The scope of the ORNL study included an evaluation of the constraints of the various chemical process

operations that may be employed and the constraints of necessary supporting operations. The latter include equipment maintenance and replacement, process control methods, product and by-product storage, and waste disposal.

2330 (ORNL/TM-12751) Implications of access hole size on tank waste retrieval system design and cost. Babcock, S.M. (Oak Ridge National Lab., TN (United States)); Kwon, D.S.; Burks, B.L.; Stoughton, R.S.; Evans, M.S. Oak Ridge National Lab., TN (United States). May 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94013406. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Environmental Restoration and Waste Management Robotics Technology Development Program has been investigating the application of robotics technology to the retrieval of waste from single-shell storage tanks for several years. The use of a large, "long-reach" manipulator to position and orient a variety of tools and other equipment has been recommended. The objective of this study is to determine the appropriate access hole size for the tank waste retrieval system installation. Previous reports on the impact of access hole size on manipulator performance are summarized. In addition, the practical limitation for access hole size based on structural limitations of the waste storage tanks, the state-of-the-art size limitations for the installation of new risers, the radiation safety implications of various access hole sizes, and overall system cost implications are considered. Basic conclusions include: (1) overall cost of remediation will be dominated by the costs of the balance of plant and time required to perform the task rather than the cost of manipulator hardware or the cost of installing a riser, (2) the most desirable solution from a manipulator controls point of view is to make the manipulator as stiff as possible and have as high as possible a natural frequency, which implies a large access hole diameter, (3) beyond some diameter; simple, uniform cross-section elements become less advantageous from a weight standpoint and alternative structures should be considered, and (4) additional shielding and contamination control measures would be required for larger holes. Parametric studies summarized in this report considered 3,790,000 l (1,000,000 gal) tanks, while initial applications are likely to be for 2,840,000 l (750,000 gal) tanks. Therefore, the calculations should be somewhat conservative, recognizing the limitations of the specific conditions considered.

2331 (ORNL/TM-12770) Explosive ordnance disposal technology demonstration using the telerobotic small emplacement excavator. Burks, B.L. (Oak Ridge National Lab., TN (United States). Robotics & Process Systems Div.); Killough, S.M.; Thompson, D.H.; Dinkins, M.A. Oak Ridge National Lab., TN (United States). Jun 1994. 121p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94015010. Source: OSTI; NTIS; GPO Dep.

The small emplacement excavator (SEE) is a ruggedized military vehicle with backhoe and front loader used by the US Army for explosive ordnance disposal (EOD), combat engineer, and general utility excavation activities. In order to evaluate the feasibility of removing personnel from the vehicle during the high risk EOD excavation tasks a development and demonstration project was initiated to evaluate performance capabilities of the SEE under telerobotic control. This feasibility study was performed at the request of the Ordnance Missile and Munitions Center and School

(OMMCS) at the Redstone Arsenal to help define requirements for further joint service development activities. Development of a telerobotic SEE (TSEE) was performed by the Oak Ridge National Laboratory (ORNL) in a project funded jointly by the US Army Project Manager for Ammunition Logistics (PM-AMMOLOG) and the Department of Energy (DOE) Office of Technology Development (OTD) Robotics Technology Development Program (RTDP). A technology demonstration of the TSEE was conducted at McKinley Range, Redstone Arsenal, Huntsville, Alabama, on September 13-17, 1993. The primary objective of the demonstration was to evaluate and demonstrate the feasibility of remote EOD. During the demonstration, approximately 40 EOD specialists were instructed on telerobotic operation of the TSEE and then were asked to complete a series of simulated EOD tasks. Upon completion of the tasks, participants completed an evaluation of the system including human factors performance data.

2332 Sonication standard laboratory module. Beugelsdijk, T.; Hollen, R.M.; Erkkila, T.H.; Bronisz, L.E.; Roybal, J.E. To Dept. of Energy. 1993. Filed date 24 Mar 1993. U.S. Patent Application 8-036,581. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009984. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A Standard Laboratory Module for automatically producing a solution of contaminants from a soil sample. A sonication tip agitates a solution containing the soil sample in a beaker while a stepper motor rotates the sample. An aspirator tube, connected to a vacuum, draws the upper layer of solution from the beaker through a filter and into another beaker. This beaker can thereafter be removed for analysis of the solution.

2333 (PNL-6415-Rev.6) Hanford Site National Environmental Policy Act (NEPA) characterization: Revision 6. Cushing, C.E. (ed.) (and others); Baker, D.A.; Chamness, M.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 235p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018726. Source: OSTI; NTIS; INIS; GPO Dep.

This sixth revision of the Hanford Site National Environmental Policy (NEPA) Characterization presents current environmental data regarding the Hanford Site and its immediate environs. This information is intended for use in preparing Site-related NEPA documentation. Chapter 4.0 summarizes up-to-date information on climate and meteorology, geology and hydrology, ecology, history and archaeology, socioeconomics, land use, and noise levels prepared by Pacific Northwest Laboratory (PNL) staff. More detailed data are available from reference sources cited or from the authors; Chapter 5.0 has been significantly updated from the fifth revision. It describes models, including their principal underlying assumptions, that are to be used in simulating realized or potential impacts from nuclear materials at the Hanford Site. Included are models of radionuclide transport in groundwater and atmospheric pathways, and of radiation dose to populations via all known pathways from known initial conditions; The updated Chapter 6.0 provides the preparer with the federal and state regulations, DOE orders and permits, and environmental standards directly applicable to the NEPA documents on the Hanford Site, following the structure of Chapter 4.0. No conclusions or recommendations are given in this report. Rather, it is a compilation of information on the Hanford Site environment

that can be utilized directly by Site contractors. This information can also be used by any interested individual seeking baseline data on the Hanford Site and its past activities by which to evaluate projected activities and their impacts.

2334 (PNL-SA-22987) Environment reconstruction for robot navigation. Bohn, S.; Thornton, E. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940449-11: Society of Photo-Optical Instrumentation Engineers conference on intelligent information systems, Orlando, FL (United States), 4-8 Apr 1994). Order Number DE94012503. Source: OSTI; NTIS; GPO Dep.

The United State Department of Energy (DOE) is facing a large task in characterizing and remediating waste tanks and their contents. Because of the hazardous materials inside the waste tanks, all of the work must be done remotely. The purpose of this paper is to show how to reconstruct an enclosed environment from various scans of a Laser Range Finder (LRF). The reconstructed environment can then be used by a robot for path planning, and by an operator to monitor the progress of the waste remediation process. Environment reconstruction consists of two tasks: image processing and laser sculpting. The image processing task focuses first on reducing the quantity of low-confidence data and on smoothing random fluctuations in the data. Then the processed range data must be converted into an XYZ Cartesian coordinate space, a process for which we examined two methods. The first method is a geometrical transform of the LRF data. The second uses an artificial neural network to transform the data to XYZ coordinates. Once an XYZ data set is computed, laser sculpting can be performed. Laser sculpting employs a hierarchical tree structure formally called an octree. The octree structure allows efficient storage of volumetric data and the ability to fuse multiple data sets. Our research has allowed us to examine the difficulties of fusing multiple LRF scans into an octree and to develop algorithms for converting an octree structure into a representation of polygon surfaces.

2335 (PNL-SA-23330) The effect of passive damping on feedback control performance of flexible manipulators. Lew, J.Y.; Evans, M.S. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9406133-2: 1994 American control conference, Baltimore, MD (United States), 29 Jun - 1 Jul 1994). Order Number DE94015000. Source: OSTI; NTIS; GPO Dep.

This paper discusses the effect of passive damping on long-reach manipulators. Specifically, this paper explains how the addition of structural damping affects the closed-loop system response of the manipulators. A single-link flexible manipulator is used to illustrate the effects of passive damping on the location of the system's pole s and zeros. The corresponding performance of the system with modified pole/zero locations is discussed. The analysis is performed including colocated and noncolocated flexible-link manipulators.

2336 (PNL-SA-24072) A redundant, 6-DOF parallel manipulator structure with improved workspace and dexterity. Stoughton, R.S. (Pacific Northwest Lab., Richland, WA (United States)); Salerno, R.; Canfield, S.; Reinholtz, C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC06-76RL01830. (CONF-940859-29: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE95004898. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a novel manipulator structure which combines two known parallel manipulator structures—a Stewart Platform (SP), and a double octahedral Variable Geometry Truss (VGT). The combined VGT + SP structure is redundant, using nine actuators to realize six-DOF motion. Combining the two structures allows the translational and orientational workspaces of the two individual structures to sum together to a much larger workspace than is generally achievable with parallel manipulator structures. In addition, the VGT portion of the structure allows the configuration of the Stewart Platform to be changed "on the fly" from one with a large workspace to one with high dexterity. A useful application of this structure is at the distal end of a truss-based manipulator, where it can serve as a dexterous wrist while preserving an internal passageway for cabling and/or conveyance systems.

2337 (PNL-SA-24676) Hydrostatic force sensor. Evans, M.S. (Pacific Northwest Lab., Richland, WA (United States)); Stoughton, R.S.; Kazerooni, H. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940859-26: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94018923. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a theoretical and experimental investigation of a new kind of force sensor which detects forces by measuring an induced pressure change in a material of large Poisson's ratio. In this investigation we develop mathematical expressions for the sensor's sensitivity and bandwidth, and show that its sensitivity can be much larger and its bandwidth is usually smaller than those of existing strain-gage-type sensors. This force sensor is well-suited for measuring large but slowly varying forces. It can be installed in a space smaller than that required by existing sensors.

2338 (PNL-SA-25050) Parametric design using IGRIP. Baker, C. (Pacific Northwest Lab., Richland, WA (United States). Applied Physics Center). Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9410231-2: 8. Deneb user group meeting, Detroit, MI (United States), 10-14 Oct 1994). Order Number DE95004937. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE) Hanford site near Richland, Washington is being cleaned up after 50 years of nuclear materials production. One of the most serious problems at the site is the waste stored in single-shell underground storage tanks. There are 149 of these tanks containing the spent fuel residue remaining after the fuel is dissolved in acid and the desired materials (primarily plutonium and uranium) are separated out. The tanks are upright cylinders 75 ft. in diameter with domed tops. They are made of reinforced concrete, have steel liners, and each tank is buried under 7-12 ft. of overburden. The tanks are up to 40-ft. high, and have capacities of 500,000, 750,000, or 1,000,000 gallons of waste. As many as one-third of these tanks are known or suspected to leak. The waste form contained in the tanks varies in consistency from liquid supernatant to peanut-butter-like gels and sludges to hard salt

cake (perhaps as hard as low-grade concrete). The current waste retrieval plan is to insert a large long-reach manipulator through a hole cut in the top of the tank, and use a variety of end-effectors to mobilize the waste and remove it from the tank. PNL has, with the assistance of Deneb robotics employees, developed a means of using the IGRIP code to perform parametric design of mechanical systems. This method requires no modifications to the IGRIP code, and all design data are stored in the IGRIP workcell. The method is presented in the context of development of a passive articulated mechanism that is used to deliver down-arm services to a gantry robot. The method is completely general, however, and could be used to design a fully articulated manipulator. Briefly, the method involves using IGCALC expressions to control manipulator joint angles, and IGCALC variables to allow user control of link lengths and offsets. This paper presents the method in detail, with examples drawn from PNL's experience with the gantry robot service-providing mechanism.

2339 (PNL-SA-25159) Micro manipulator motion control to counteract macro manipulator structural vibrations. Lew, J.Y.; Trudnowski, D.J.; Evans, M.S.; Bennett, D.W. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950232-17: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95007282. Source: OSTI; NTIS; GPO Dep.

Inertial force damping control by micro manipulator modulation is proposed to suppress the vibrations of a micro/macro manipulator system. The proposed controller, developed using classical control theory, is added to the existing control system. The proposed controller uses real-time measurements of macro manipulator flexibility to adjust the motion of the micro manipulator to counteract structural vibrations. Experimental studies using an existing micro/macro flexible link manipulator testbed demonstrate the effectiveness of the proposed approach to suppression of vibrations in the macro/micro manipulator system using micro-manipulator-based inertial active damping control.

2340 (PNL-SA-25387) A variable geometry truss manipulator for positioning large payloads. Stoughton, R.S. (Pacific Northwest Lab., Richland, WA (United States)); Tucker, J.C.; Horner, C.G. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950232-29: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95008926. Source: OSTI; NTIS; INIS; GPO Dep.

A major thrust within the Department of Energy's (DOE) Decontamination and Dismantling (D&D) Robotics program is the development of a Selective Equipment Removal System (SERS). SERS will consist of a mobile vehicle, a Dual-Arm Work Module (DAWM), and a deployment manipulator capable of extending the DAWM up to 6.096m (20) from the vehicle. The DAWM, built by RedZone Robotics, includes two Schilling Titan II manipulators, a unique five degree-of-freedom (DOF) module for positioning/orienting the two Schilling arms, and a massive steel backplane to maintain structural rigidity. Together with its payload, the DAWM weighs about 975 kg (2150 pounds). In order to accurately position the DAWM, the Pacific Northwest Laboratory (PNL) together with the National Aeronautics and

Space Administration's Langley Research Center (NASA LARC) are developing a deployment manipulator, which includes two double-octahedral Variable Geometry Truss (VGT) modules connected with a static truss section. The entire SERS system (Figure 1) will include the mobile vehicle, a 2-DOF base actuation system (waist rotate and pitch) with an output link approximately 2.134m (7) in length, the VGT system and the DAWM. The VGT system (Figure 2) consists of a 1.067m (42) diameter (~1.346m (53) long) base VGT, which mounts to the end of the output link of the base actuation system, a 1.524m (60) long static truss section which tapers from 1.067m (42) diameter at its base to 0.8128m (32) diameter at the end, and a 0.8128m (32) diameter (~1.0922m (43) long) tip VGT to which the DAWM is mounted. The stiffness of the VGT system is such that with the base VGT mounted to a rigid base and the VGT system oriented horizontally (worst case), the static deflection of the DAWM together with full payload will be less than 0.0254m.

2341 (SAND-94-0513C) What is an open architecture robot controller? Ford, W.E. Sandia National Labs., Albuquerque, NM (United States). 14 Feb 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940869-1: 9. Institute of Electrical and Electronics Engineers (IEEE) international symposium on intelligent control, Columbus, OH (United States), 16-18 Aug 1994). Order Number DE94007854. Source: OSTI; NTIS; GPO Dep.

This paper addresses the issue of what is an open architecture robot controllers. Three different classifications are defined along with the various advantages and shortcomings of each approach. Knowledge from past research and new technology has been included in this analysis. The conclusions recommend a communication-based hybrid approach with well defined interfaces between modules.

2342 (SAND-94-0595C) Robotics Technology Development Program Cross Cutting and Advanced Technology. Harrigan, R.W.; Horschel, D.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940859-12: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94008952. Source: OSTI; NTIS; INIS; GPO Dep.

Need-based cross cutting technology is being developed which is broadly applicable to the clean up of hazardous and radioactive waste within the US Department of Energy's complex. Highly modular, reusable technologies which plug into integrated system architectures to meet specific robotic needs result from this research. In addition, advanced technologies which significantly extend current capabilities such as automated planning and sensor-based control in unstructured environments for remote system operation are also being developed and rapidly integrated into operating systems.

2343 (SAND-94-0596C) Remote use of distributed robotics resources to enhance technology development and insertion. Harrigan, R.W.; McDonald, M.J.; Davies, B.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940859-14: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94009285. Source: OSTI; NTIS; GPO Dep.

This paper describes Virtual Collaborative Environments (VCEs), an information architecture that enables remote sharing of mechatronic (intelligent electrochemical devices) resources. This architecture will leverage the proposed National Information Infrastructure (NII) or Information Highway to share valuable resources and reduce product-to-market cycles. Benefits of sharing mechatronic resources with VCEs are explored. An existing prototype VCE is described and experimental and illustrative results from using the prototype VCE system are discussed.

2344 (SAND-94-0844) Research on robotics by principal investigators of the Robotics Technology Development Program. Harrigan, R.W. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009662. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Energy's Office of Technology Development has been developing robotics and automation technologies for the clean-up and handling of hazardous and radioactive waste through one of its major elements, Cross Cutting and Advanced Technology development. CC&AT university research and development programs recognize the strong technology, base resident in the university community and sponsor a focused technology research and development program which stresses close interaction between the university sector and the DOE community. This report contains a compilation of research articles by each of 14 principle investigators supported by CC&AT to develop robotics and automation technologies for the clean-up and handling of hazardous and radioactive waste. This research has led to innovative solutions for waste clean-up problems, and it has moved technology out of university laboratories into functioning systems which has allowed early evaluation by site technologists.

2345 (SAND-94-1235) A review of technology for verification of waste removal from Hanford Underground Storage Tanks (WHC Issue 30). Thunborg, S. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001793. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation of waste from Underground Storage Tanks (UST) at the Hanford Waste storage sites will require removal of all waste to a nearly clean condition. Current requirements are 99% clean. In order to meet remediation legal requirements, a means to remotely verify that the waste has been removed to sufficient level is needed. This report discusses the requirements for verification and reviews major technologies available for inclusion in a verification system. The report presents two operational scenarios for verification of residual waste volume. Thickness verification technologies reviewed are Ultrasonic Sensors, Capacitance Type Sensors, Inductive Sensors, Ground Penetrating Radar, and Magnetometers. Of these technologies Inductive (Metal Detectors) and Ground Penetrating Radar appear to be the most suitable for use as waste thickness sensors.

2346 (SAND-94-1237) A review of technology for contact protection of remediation manipulators (WHC Issue 39). Thunborg, S. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001794. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation of waste from Underground Storage Tanks (UST) at Hanford will require the use of large remotely controlled equipment. Inherent safety methods need to be identified and incorporated into the retrieval system to prevent contact damage to the UST or to the remediation equipment. This report discusses the requirements for an adequate protection system and reviews the major technologies available for inclusion in a damage protection system. The report proposes that adequate reliability of a protection system can be achieved through the use of two fully-independent subsafety systems. Safety systems technologies reviewed were Force/Torque Sensors, Overload Protection Devices, Ultrasonic Sensors, Capacitance Sensors, Controller Software Limit Graphic Collision Detection, and End Point Tracking. A relative comparison between retrieval systems protection technologies is presented.

2347 (SAND-94-2072C) Optimal trajectories for flexible-link manipulator slewing using recursive quadratic programming: Experimental verification. Parker, G.G.; Eisler, G.R.; Feddema, J.T. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940859-25: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94018741. Source: OSTI; NTIS; INIS; GPO Dep.

Procedures for trajectory planning and control of flexible link robots are becoming increasingly important to satisfy performance requirements of hazardous waste removal efforts. It has been shown that utilizing link flexibility in designing open loop joint commands can result in improved performance as opposed to damping vibration throughout a trajectory. The efficient use of link compliance is exploited in this work. Specifically, experimental verification of minimum time, straight line tracking using a two-link planar flexible robot is presented. A numerical optimization process, using an experimentally verified modal model, is used for obtaining minimum time joint torque and angle histories. The optimal joint states are used as commands to the proportional-derivative servo actuated joints. These commands are precompensated for the nonnegligible joint servo actuator dynamics. Using the precompensated joint commands, the optimal joint angles are tracked with such fidelity that the tip tracking error is less than 2.5 cm.

2348 (SAND-94-2354C) Advanced robotic technologies for transfer at Sandia National Laboratories. Bennett, P.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940917-1: 3. international conference on heat transfer: advanced computational methods in heat transfer, Southampton (United Kingdom), 5-7 Sep 1994). Order Number DE95001617. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous operations which have in the past been completed by technicians are under increased scrutiny due to high costs and low productivity associated with providing protective clothing and environments. As a result, remote systems are needed to accomplish many hazardous materials handling tasks such as the clean-up of waste sites in which the exposure of personnel to radiation, chemical, explosive and other hazardous constituents is unacceptable. Computer models augmented by sensing, and structured, modular computing environments are proving effective in automating many unstructured hazardous tasks. Work at

Sandia National Laboratories (SNL) has focused on applying flexible automation (robotics) to meet the needs of the U.S. Department of Energy (USDOE). Dismantling facilities, environmental remediation, and materials handling in changing, hazardous environments lead to many technical challenges. Computer planning, monitoring and operator assistance shorten training cycles, reduce errors, and speed execution of operations. Robotic systems that re-use well-understood generic technologies can be much better characterized than robotic systems developed for a particular application, leading to a more reliable and safer systems. Further safety in robotic operations results from use of environmental sensors and knowledge of the task and environment. Collision detection and avoidance is achieved from such sensor integration and model-based control. This paper discusses selected technologies developed at SNL for use within the USDOE complex that have been or are ready for transfer to government and industrial suppliers. These technologies include sensors, sub-systems, and the design philosophy applied to quickly integrate them into a working robotic system. This paper represents the work of many people at the Intelligent Systems and Robotics Center at SNL, to whom the credit belongs.

2349 (SAND-95-0610C) A collision avoidance system for workplace protection. Schmitt, D.J. (Sandia National Labs., Albuquerque, NM (United States)); Weber, T.M.; Novak, J.L.; Maslakowski, J.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505169-2: International robots and vision automation show and conference, Detroit, MI (United States), 8-11 May 1995). Order Number DE95009842. Source: OSTI; NTIS; GPO Dep.

This paper describes an application of Sandia's non-contact capacitive sensing technology for collision avoidance during the manufacturing of rocket engine thrust chambers. The collision avoidance system consists of an octagon shaped collar with a capacitive proximity sensor mounted on each face. The sensors produced electric fields which extend several inches from the face of the collar and detect potential collisions between the robot and the workpiece. A signal conditioning system processes the sensor output and provides varying voltage signals to the robot controller for stopping the robot.

2350 (UCRL-ID-116220) Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program. Couture, S. Lawrence Livermore National Lab., CA (United States). 18 Feb 1994. 324p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95000512. Source: OSTI; NTIS; INIS; GPO Dep.

One tool being developed for dislodging and fragmenting the hard salt cake waste in the single-shell nuclear waste tanks at the Hanford Reservation near Richland, Washington, is the hydraulic impact end effector (HIEE). This tool operates by discharging 11-in. slugs of water at ultrahigh pressures. The HIEE was designed, built, and initially tested in 1992. Work in 1993 included advanced developments of the HIEE to further investigate its fragmentation abilities and to determine more effective operating procedures. These tests showed that more fragmentation can be achieved by increasing the charge pressure of 40 kpsi to 55 kpsi and by the use of different operating procedures. The size of the material and the impact energy of the water slug fired from

the HIEE are believed to be major factors in material fragmentation. The material's ability to fracture also appears to depend on the distance a fracture or crack line must travel to a free surface. Thus, larger material is more difficult to fracture than smaller material. Discharge pressures of 40 kpsi resulted in little penetration or fracturing of the material. At 55 kpsi, however, the size and depth of the fractures increased. Nozzle geometry had a significant effect on fragment size and quantity. Fragmentation was about an order of magnitude greater when the HIEE was discharged into drilled holes rather than onto the material surface. Since surface shots tend to create craters, a multi-shot procedure, coupled with an advanced nozzle design, was used to drill (crater) deep holes into large material. With this procedure, a 600-lb block was reduced to smaller pieces without the use of any additional equipment. Through this advanced development program, the HIEE has demonstrated that it can quickly fragment salt cake material into small, easily removable fragments. The HIEE's material fragmentation ability can be substantially increased through the use of different nozzle geometries and operating procedures.

2351 (UCRL-JC-117153) Application of glove box robotics to hazardous waste management. Dennison, D.K.; Hurd, R.L.; Merrill, R.D.; Reitz, T.C. Lawrence Livermore National Lab., CA (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950232-24: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95008380. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Livermore Laboratory (LLNL) is developing a semi-automated system for handling, characterizing, processing, sorting, and repackaging hazardous wastes containing tritium. The system combines an IBM developed gantry robot with a special glove box enclosure designed to protect the operators and minimize the potential release of tritium to the atmosphere. All hazardous waste handling and processing will be performed remotely using the robot in a telerobotic mode for one-of-a-kind functions and in an autonomous mode for repetitive type operations. The system will initially be used in conjunction with a portable gas system designed to capture any gaseous phase tritium released into the glove box. This paper presents the objectives of this program, provides background related to LLNL's robotics and waste handling program, describes the major system components, outlines system operation, and discusses current status and plans.

2352 (UCRL-JC-118890) Advanced robotics handling and controls applied to Mixed Waste characterization, segregation and treatment. Grasz, E.; Huber, L.; Horvath, J.; Roberson, P.; Wilhelmsen, K.; Ryon, R. Lawrence Livermore National Lab., CA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950232-25: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95008457. Source: OSTI; NTIS; INIS; GPO Dep.

At Lawrence Livermore National Laboratory under the Mixed Waste Operations program of the Department of Energy Robotic Technology Development Program (RTDP), a key emphasis is developing a total solution to the problem of characterizing, handling and treating complex and potentially unknown mixed waste objects. LLNL has been successful at

looking at the problem from a system perspective and addressing some of the key issues including non-destructive evaluation of the waste stream prior to the materials entering the handling workcell, the level of automated material handling required for effective processing of the waste stream objects (both autonomous and tele-operational), and the required intelligent robotic control to carry out the characterization, segregation, and waste treating processes. These technologies were integrated and demonstrated in a prototypical surface decontamination workcell this past year.

2353 (WHC-SA-2302) Remote automated material handling of radioactive waste containers. Greager, T.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940602-20: 35. annual meeting of the American Nuclear Society, New Orleans, LA (United States), 11-16 Jun 1994). Order Number DE95001643. Source: OSTI; NTIS; INIS; GPO Dep.

To enhance personnel safety, improve productivity, and reduce costs, the design team incorporated a remote, automated stacker/retriever, automatic inspection, and automated guidance vehicle for material handling at the Enhanced Radioactive and Mixed Waste Storage Facility - Phase V (Phase V Storage Facility) on the Hanford Site in south-central Washington State. The Phase V Storage Facility, scheduled to begin operation in mid-1997, is the first low-cost facility of its kind to use this technology for handling drums. Since 1970, the Hanford Site's suspect transuranic (TRU) wastes and, more recently, mixed wastes (both low-level and TRU) have been accumulating in storage awaiting treatment and disposal. Currently, the Hanford Site is only capable of onsite disposal of radioactive low-level waste (LLW). Nonradioactive hazardous wastes must be shipped off site for treatment. The Waste Receiving and Processing (WRAP) facilities will provide the primary treatment capability for solid-waste storage at the Hanford Site. The Phase V Storage Facility, which accommodates 27,000 drum equivalents of contact-handled waste, will provide the following critical functions for the efficient operation of the WRAP facilities: (1) Shipping/Receiving; (2) Head Space Gas Sampling; (3) Inventory Control; (4) Storage; (5) Automated/Manual Material Handling.

2354 (WHC-SA-2448) First generation long-reach manipulator for retrieval of waste from Hanford single-shell tanks. Gibbons, P.W.; McDaniel, L.B. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232-12: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95003045. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy, Richland Operations Office, has established the Tank Waste Remediation System to resolve environmental and safety issues related to underground waste-storage tanks at the Hanford Site. The Tank Waste Remediation System has identified the use of an advanced-technology, long-reach manipulator system as a low-water-addition retrieval alternative to past-practice sluicing.

2355 (WHC-SA-2627) Control system design for robotic underground storage tank inspection systems. Kiebel, G.R. Westinghouse Hanford Co., Richland, WA

(United States). Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232-10: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95002475. Source: OSTI; NTIS; INIS; GPO Dep.

Control and data acquisition systems for robotic inspection and surveillance systems used in nuclear waste applications must be capable, versatile, and adaptable to changing conditions. The nuclear waste remediation application is dynamic - requirements change as public policy is constantly re-examined and refocused, and as technology in this area advances. Control and data acquisition systems must adapt to these changing conditions and be able to accommodate future missions, both predictable and unexpected. This paper describes the control and data acquisition system for the Light Duty Utility Arm (LDUA) System that is being developed for remote surveillance and inspection of underground storage tanks at the Hanford Site and other US Department of Energy (DOE) sites. It is a high-performance system which has been designed for future growth. The priority mission at the Hanford site is to retrieve the waste generated by 50 years of production from its present storage and process it for final disposal. The LDUA will help to gather information about the waste and the tanks it is stored in to better plan and execute the cleanup mission.

2356 (WHC-SA-2664) PUREX irradiated fuel recovery simulation. Jaquish, W.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9410231-1: 8. Deneb user group meeting, Detroit, MI (United States), 10-14 Oct 1994). Order Number DE95001640. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the application of IGRIP (Interactive Graphical Robot Instruction Program) to assist environmental remediation efforts at the Department of Energy PUREX Plant at the Hanford Site. An IGRIP simulation was developed to plan, review, and verify proposed remediation activities. This simulation was designed to satisfy a number of unique purposes that each placed specific constraints and requirements on the design and implementation of the simulation. These purposes and their influence on the design of the simulation are presented. A discussion of several control code architectures for mechanical system simulations, including their advantages and limitations, is also presented.

2357 (WHC-SA-2705) Telepresence and virtual environment applications on the light duty utility arm system. Pardini, A.F. (Westinghouse Hanford Co., Richland, WA (United States)); Rod, S.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232-15: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95006836. Source: OSTI; NTIS; INIS; GPO Dep.

The Tri-Party Agreement was initiated in 1989 to provide a thirty-year clean-up plan for the United States Department of Energy's (DOE) Hanford Site. This plan addresses the remediation of hazardous chemical and radioactive wastes with a major emphasis on the characterization of Hanford's underground waste storage tanks. To assist in this task the DOE is funding the development of a light duty robotic arm capable of deploying various tools which can inspect and characterize the interior of DOE waste tanks. Current development includes two new technologies - stereoscopic telepresence,

which will allow three-dimensional viewing of the waste tank interior; and "virtual environments" (or "virtual reality"), which will provide computer-simulated world wherein operators can practice inspections and other activities prior to performing actual operations in real waste tanks.

2358 (WHC-SD-TD-CR-001) Design criteria for the light duty utility arm system end effectors. Pardini, A.F. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005464. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the criteria for the design of end effectors that will be used as part of the Light Duty Utility Arm (LDUA) System. The LDUA System consists of a deployment vehicle, a vertical positioning mast, a light duty multi-axis robotic arm, a tank riser interface and confinement, a tool interface plate, a control system, and an operations control trailer. The criteria specified in this document will apply to all end effector systems being developed for use on or with the LDUA system at the Hanford site. The requirement stipulated in this document are mandatory.

2359 (WHC-SD-TD-ER-004) Usability testing of the human-machine interface for the Light Duty Utility Arm System. Kiebel, G.R.; Ellis, J.E.; Masliah, M.R. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001564. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the usability testing that has been done for the control and data acquisition system for the Light Duty Utility Arm (LDUA) System. A program of usability testing has been established as a part of a process for making the LDUA as easy to use as possible. The LDUA System is being designed to deploy a family of tools, called End Effectors, into underground storage tanks by means of a robotic arm on the end of a telescoping mast, and to collect and manage the data that they generate. The LDUA System uses a vertical positioning mast, to lower the arm into a tank through an existing 30.5 cm access riser. A Mobile Deployment Subsystem is used to position the mast and arm over a tank riser for deployment, and to transport them from tank to tank. The LDUA System has many ancillary subsystems including the Operations Control Trailer, the Tank Riser Interface and Confinement Subsystem, the Decontamination Subsystem, and the End Effector Exchange Subsystem. This work resulted in the identification of several important improvements to the LDUA control and data acquisition system before the design was frozen. The most important of these were color coding of joints in motion, simultaneous operator control of multiple joints, and changes to the field-of-views of the camera lenses for the robot and other camera systems.

2360 (WHC-SD-TD-ICD-001) Light Duty Utility Arm interface control document plan. Engstrom, J.W. Westinghouse Hanford Co., Richland, WA (United States). 27 Dec 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005068. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the interface control documents that will be used to identify and control interface features throughout all phases of the Light Duty Utility Arm (LDUA) development and design. After the system is built, delivered and installed in the Cold Test Facility and later at the tank

farm, the Interface Control Documents can be used in maintaining the configuration control process. The Interface Control Document will consist of Interface Control Drawings and a data base directly tied to the Interface Control Drawings. The data base can be used as an index to conveniently find interface information. Design drawings and other text documents that contain interface information will appear in the database. The Interface Control Drawings will be used to document and control the data and information that define the interface boundaries between systems, subsystems and equipment. Also, the interface boundaries will define the areas of responsibility for systems and subsystems. The drawing will delineate and identify all the physical and functional interfaces that required coordination to establish and maintain compatibility between the co-functioning equipment, computer software, and the tank farm facilities. An appendix contains the Engineering interface control database system riser manual.

2361 (WSRC-MS-94-008) Overview of robotics for Mixed Waste Operations. Ward, C.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940859-3: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94006379. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Operations Robotics program is developing robotics technology to make the handling and treatment of Department of Energy mixed waste; better, faster, safer and cheaper. This technology will provide remote operations and not require humans to be in contact with this radioactive and hazardous waste. The technology includes remote handling and opening of waste containers, remote removal of waste from the containers, remote characterization and sorting of the waste, and remote treatment and disposition of the waste. The initial technology development program culminated in an integrated demonstration in November 1993 and each aspect of this technology is described.

2362 (WSRC-MS-94-069) An autonomous mobile robot to perform waste drum inspections. Peterson, K.D.; Ward, C.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940859-1: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94007186. Source: OSTI; NTIS; INIS; GPO Dep.

A mobile robot is being developed by the Savannah River Technology Center (SRTC) Robotics Group of Westinghouse Savannah River company (WSRC) to perform mandated inspections of waste drums stored in warehouse facilities. The system will reduce personnel exposure and create accurate, high quality documentation to ensure regulatory compliance. Development work is being coordinated among several DOE, academic and commercial entities in accordance with DOE's technology transfer initiative. The prototype system was demonstrated in November of 1993. A system is now being developed for field trials at the Fernald site.

2363 (WSRC-MS-94-0499) The Stored Waste Autonomous Mobile Inspector (SWAMI). Peterson, K.D.; Ward, C.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 8p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950232-3: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95000532. Source: OSTI; NTIS; INIS; GPO Dep.

A mobile robot system called Stored Waste Autonomous Mobile Inspector (SWAMI) is under development by the Savannah River Technology Center (SRTC) Robotics Group of Westinghouse Savannah River Company (WSRC) to perform mandated inspections of waste drums stored in warehouse facilities. The system will reduce personnel exposure to potential hazards and create accurate, high-quality documentation to ensure regulatory compliance and enhance waste management operations. Development work is coordinated among several Department of Energy (DOE), academic, and commercial entities in accordance with DOE's technology transfer initiative. The prototype system, SWAMI I, was demonstrated at Savannah River Site (SRS) in November, 1993. SWAMI II is now under development for field trials at the Fernald site.

2364 (WSRC-MS-94-0658) Development of the stored waste autonomous mobile inspector (SWAMI II). Peterson, K.D.; Ward, C.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-17: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006463. Source: OSTI; NTIS; INIS; GPO Dep.

A mobile robot system called the Stored Waste Autonomous Mobile Inspector (SWAMI) is under development by the Savannah River Technology Center (SRTC) Robotics Group of Westinghouse Savannah River Company (WSRC) to perform mandated inspections of waste drums stored in warehouse facilities. The system will reduce personnel exposure to potential hazards and create accurate, high-quality documentation to ensure regulatory compliance and enhance waste management operations. Development work is coordinated among several Department of Energy (DOE), academic, and commercial entities in accordance with DOE's technology transfer initiative. The prototype system, SWAMI I, was demonstrated at Savannah River Site (SRS) in November, 1993. SWAMI II is now under development for field trials at the Fernald site.

2365 Robotics and remote systems for hazardous environments. Jamshidi, M.; Eicker, P. (eds.). 229p. Prentice Hall, Englewood Cliffs, NJ (United States) (1993).

This is the first volume in a series of books to be published by Prentice Hall on Environmental and Intelligent Manufacturing Systems. The editors have assembled an interdisciplinary collection of authors from industry, government, and academia, that provide a broad range of expertise on robotics and remote systems. Readily accessible to practicing engineers, the book provides case studies and introduces new technology applicable to remote operations in unstructured and/or hazardous environments. Chapter 1 gives an overview of the US Environmental Protection Agency's efforts to apply robotic technology to assist in the operations at hazardous waste sites. The next chapter focuses on the theory and implementation of robust impedance control for robotic manipulators. Chapter 3 presents a discussion on the integration of failure tolerance into robotic systems. The next two chapters address the issue of sensory feedback and its indispensable role in remote and/or hazardous environments. Chapter 6 presents

numerous examples of robots and telemanipulators that have been applied for various tasks at the DOE's Savannah River Site. The following chapter picks up on this theme and discusses the fundamental paradigm shifts that are required in artificial intelligence for robots to deal with hazardous, unstructured, and dynamic environments. Chapter 8 returns to the issue of impedance control first raised in Chapter 2. While the majority of the applications discussed in this book are related to the nuclear industry, chapter 9 considers applying telerobotics for the control of traditional heavy machinery that is widely used in forestry, mining, and construction. The final chapter of the book returns to the topic of artificial intelligence's role in producing increased autonomy for robotic systems and provides an interesting counterpoint to the philosophy of reactive control discussed earlier.

2366 System for exchanging tools and end effectors on a robot. Burry, D.B.; Williams, P.M. To Dept. of Energy, Washington, DC (United States). U.S. Patent 4,993,139/A. 19 Feb 1991. Filed date 2 Apr 1990. U.S. Patent Application 7-502,962. Int. Cl. B23Q 3/155. [10p.] DOE Contract AC04-76DP03533. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A system and method for exchanging tools and end effectors on a robot permits exchange during a programmed task. The exchange mechanism is located off the robot, thus reducing the mass of the robot arm and permitting smaller robots to perform designated tasks. A simple spring/collet mechanism mounted on the robot is used which permits the engagement and disengagement of the tool or end effector without the need for a rotational orientation of the tool to the end effector/collet interface. As the tool changing system is not located on the robot arm no umbilical cords are located on robot. 12 figures.

2367 Radioactive waste material melter apparatus. Newman, D.F.; Ross, W.A. To Battelle Memorial Inst., Richland, WA (United States). U.S. Patent 4,919,190/A. 24 Apr 1990. Filed date 18 Aug 1988. U.S. Patent Application 7-234,253. Int. Cl. B22D 27/02. [10p.] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An apparatus for preparing metallic radioactive waste material for storage is disclosed. The radioactive waste material is placed in a radiation shielded enclosure. The waste material is then melted with a plasma torch and cast into a plurality of successive horizontal layers in a mold to form a radioactive ingot in the shape of a spent nuclear fuel rod storage canister. The apparatus comprises a radiation shielded enclosure having an opening adapted for receiving a conventional transfer cask within which radioactive waste material is transferred to the apparatus. A plasma torch is mounted within the enclosure. A mold is also received within the enclosure for receiving the melted waste material and cooling it to form an ingot. The enclosure is preferably constructed in at least two parts to enable easy transport of the apparatus from one nuclear site to another. 8 figs.

CHARACTERIZATION

Refer also to citation(s) 15, 17, 18, 24, 85, 118, 243, 246, 1678, 1840, 1880, 1885, 1887, 1893, 2098, 2986, 3041, 3042, 3075

2368 (ANL-93/45) Effects of radionuclide decay on waste glass behavior: A critical review. Wronkiewicz,

D.J. Argonne National Lab., IL (United States). Dec 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94010073. Source: OSTI; NTIS; INIS; GPO Dep.

This paper is an extension of a chapter in an earlier report [1] that provides an updated review on the status of radiation damage problems in nuclear waste glasses. This report will focus on radiation effects on vitrified borosilicate nuclear waste glasses under conditions expected in the proposed Yucca mountain repository. Radiation effects on high-level waste glasses and their surrounding repository environment are important considerations for radionuclide immobilization because of the potential to alter the glass stability and thereby influence the radionuclide retentive properties of this waste form. The influence of radionuclide decay on vitrified nuclear waste may be manifested by several changes, including volume, stored energy, structure, microstructure, mechanical properties, and phase separation. Radiation may also affect the composition of aqueous fluids and atmospheric gases in relatively close proximity to the waste form. What is important to the radionuclide retentive properties of the repository is how these radiation effects collectively or individually influence the durability and radionuclide release from the glass in the event of liquid water contact.

2369 (ANL-94/14) Nuclear Waste Programs semianual progress report, April-September 1992. Bates, J.K. (and others); Bradley, C.R.; Buck, E.C. Argonne National Lab., IL (United States). May 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94016807. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports on the work done by the Nuclear Waste Programs of the Chemical Technology Division (CMT), Argonne National Laboratory, in the period April-September 1992. In these programs, studies are underway on the performance of waste glass and spent fuel in projected nuclear repository conditions to provide input to the licensing of the nation's high-level waste repositories.

2370 (ANL-94/17) Critical review of glass performance modeling. Bourcier, W.L. (Lawrence Livermore National Lab., CA (United States)). Argonne National Lab., IL (United States). Jul 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94018062. Source: OSTI; NTIS; INIS; GPO Dep.

Borosilicate glass is to be used for permanent disposal of high-level nuclear waste in a geologic repository. Mechanistic chemical models are used to predict the rate at which radionuclides will be released from the glass under repository conditions. The most successful and useful of these models link reaction path geochemical modeling programs with a glass dissolution rate law that is consistent with transition state theory. These models have been used to simulate several types of short-term laboratory tests of glass dissolution and to predict the long-term performance of the glass in a repository. Although mechanistically based, the current models are limited by a lack of unambiguous experimental support for some of their assumptions. The most severe problem of this type is the lack of an existing validated mechanism that controls long-term glass dissolution rates. Current models can be improved by performing carefully designed experiments and using the experimental results to validate the rate-controlling mechanisms implicit in the models. These models should be supported with long-term experiments to be used for model validation. The

mechanistic basis of the models should be explored by using modern molecular simulations such as molecular orbital and molecular dynamics to investigate both the glass structure and its dissolution process.

2371 (ANL/CMT-ACL/CP-83198) Detection of emission sources using passive-remote Fourier transform infrared spectroscopy. Demirgian, J.C. (Argonne National Lab., IL (United States)); Macha, S.M.; Darby, S.M.; Dittilo, J. Argonne National Lab., IL (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950209-7: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE95009920. Source: OSTI; NTIS; INIS; GPO Dep.

The detection and identification of toxic chemicals released in the environment is important for public safety. Passive-remote Fourier transform infrared (FTIR) spectrometers can be used to detect these releases. Their primary advantages are their small size and ease of setup and use. Open-path FTIR spectrometers are used to detect concentrations of pollutants from a fixed frame of reference. These instruments detect plumes, but they are too large and difficult to aim to be used to track a plume to its source. Passive remote FTIR spectrometers contain an interferometer, optics, and a detector. They can be used on tripods and in some cases can be hand-held. A telescope can be added to most units. We will discuss the capability of passive-remote FTIR spectrometers to detect the origin of plumes. Low concentration plumes were released using a custom-constructed vaporizer. These plumes were detected with different spectrometers from different distances. Passive-remote spectrometers were able to detect small 10 cm on a side chemical releases at concentration-pathlengths at the low parts per million-meter (ppm-m) level.

2372 (ANL/CMT-ACL/CP-83255) Determination of long-lived actinides in soil leachates by inductively coupled plasma: Mass spectrometry. Crain, J.S.; Smith, L.L.; Yaeger, J.S.; Alvarado, J.A. Argonne National Lab., IL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940401-14: International conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 10-16 Apr 1994). Order Number DE94013871. Source: OSTI; NTIS; INIS; GPO Dep.

Inductively coupled plasma - mass spectrometry (ICP-MS) was used to concurrently determine multiple long-lived ($t_{1/2} > 10^4$ y) actinide isotopes in soil samples. Ultrasonic nebulization was found to maximize instrument sensitivity. Instrument detection limits for actinides in solution ranged from 50 mBq L⁻¹ (²³⁹Pu) to 2 μ Bq L⁻¹ (²³⁵U). Hydride adducts of ²³²Th and ²³⁸U interfered with the determinations of ²³³U and ²³⁹Pu; thus, extraction chromatography was used to eliminate the sample matrix, concentrate the analytes, and separate uranium from the other actinides. Alpha spectrometric determinations of ²³⁰Th, ²³⁹Pu, and the ²³⁴U/²³⁸U activity ratio in soil leachates compared well with ICP-MS determinations; however, there were some small systematic differences (ca. 10%) between ICP-MS and alpha spectrometric determinations of ²³⁴U and ²³⁸U activities.

2373 (ANL/CMT/CP-82156) Characterization studies of actinide contamination on Johnston Atoll. Wolf, S.F.; Bates, J.K.; Brown, N.R.; Buck, E.C.; Dietz, N.L.; Fortner, J.A.; Gong, Meiling. Argonne National Lab., IL (United

States). [1994]. 7p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-65: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015087. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents results that indicates that plutonium and americium contamination of Johnson Atoll soil and sludge from the cleanup plant settling pond is dispersed. The ²⁴¹Am/²³⁹Pu ratio was essentially identical for all analyzed material. Except for one "hot particle," no discrete Pu particles were located in untreated coral soil by SEM even though our sample contained both ²⁴¹Am and ²³⁹Pu activity measurable by gamma-ray spectrometry. Alpha particle spectrometry analysis of sequentially filtered sludge showed small that activity is associated with particles as 0.4 μ m in diameter. Thin section analysis revealed that the "hot particle" was a fragment of stainless steel with a layer of oxidized Pu, U, and other metals deposited on the outside. This Pu-containing layer was covered with a layer of coral soil that formed on the oxidized Pu/U phase during the process of weathering on JA. Analyses of all samples except the "hot particle" with SEM or TEM coupled with EDS did not reveal the presence of any distinct Pu phases, despite measurable activity in these samples. Together, these findings are consistent with the Pu and Am being highly dispersed throughout the contaminated soil and sludge. Direct evidence for association of Pu with coral was observed in the thin section of the "hot particle." A possible mechanism for the dispersal of contamination is that weathering of fragments from the aborted missile leads to complexation of Pu with calcium carbonate followed by adsorption onto the coral soil surface. This process has not led to measurable fractionation of Am from its Pu parent.

2374 (ANL/CMT/CP-83184) Management of radioactive waste from nuclear power plants: An overview. Devgun, J.S. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940812-14: 29. intersociety energy conversion engineering conference, Monterey, CA (United States), 7-12 Aug 1994). Order Number DE94015035. Source: OSTI; NTIS; INIS; GPO Dep.

The nuclear power industry, which accounts for about 20% of the total electricity supply, is a vital part of the nation's energy resource. While it generates approximately one-third of the commercial low-level radioactive waste produced in the country, it has achieved one of the most successful examples in waste minimization. On the other hand, progress on development of new disposal facilities by the state compacts is currently stalled. The milestones have been repeatedly postponed, and the various Acts passed by Congress on nuclear waste disposal have not accomplished what they were intended to do. With dwindling access to waste disposal sites and with escalating disposal costs, the power plant utilities are forced to store wastes onsite as an interim measure. However, such temporary measures are not a permanent solution. A national will is sorely needed to break out of the current impasse.

2375 (ANL/CMT/CP-83895) Behavior of spent fuel under unsaturated conditions. Finn, P.A. (Argonne National Lab., IL (United States). Chemical Technology Div.); Hoh, J.C.; Bates, J.K.; Wolf, S.F. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207-33: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009899. Source: OSTI; NTIS; INIS; GPO Dep.

To evaluate the performance of spent fuel in the potential repository at Yucca Mountain, Nevada, spent fuel fragments are being exposed to small and intermittent amounts of simulated groundwater under unsaturated conditions. Both the leachate and the visual appearance of the spent fuel have been characterized for 581 days of testing. The amount of Am and Cm measured in the leachates was one to two orders of magnitude greater than that released from spent fuel under saturated conditions. The cause of this difference has not been firmly identified but may be attributable to the presence of large amounts of actinide-containing colloids in the leachate of the unsaturated tests.

2376 (ANL/CMT/CP-84043) Conditioning of spent nuclear fuel for permanent disposal. Laidler, J.J. Argonne National Lab., IL (United States). [1994]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9408151-5: Dixy Lee Ray memorial symposium on science-based environmental management, Seattle, WA (United States), 30 Aug - 2 sep 1994). Order Number DE95001100. Source: OSTI; NTIS; INIS; GPO Dep.

A compact, efficient method for conditioning spent nuclear fuel is under development. This method, known as pyrochemical processing, or "pyroprocessing," provides a separation of fission products from the actinide elements present in spent fuel and further separates pure uranium from the transuranic elements. The process can facilitate the timely and environmentally-sound treatment of the highly diverse collection of spent fuel currently in the inventory of the United States Department of Energy (DOE). The pyroprocess utilizes elevated-temperature processes to prepare spent fuel for fission product separation; that separation is accomplished by a molten salt electrorefining step that provides efficient (99.9%) separation of transuranics. The resultant waste forms from the pyroprocess are stable under envisioned repository environment conditions and highly leach-resistant. Treatment of any spent fuel type produces a set of common high-level waste forms, one a mineral and the other a metal alloy, that can be readily qualified for repository disposal and preclude the substantial costs that would be associated with the qualification of the numerous spent fuel types included in the DOE inventory.

2377 (ANL/CMT/CP-84354) Pyroprocessing oxide spent nuclear fuels for efficient disposal. McPheeters, C.C. (Argonne National Lab., IL (United States). Chemical Technology Div.); Pierce, R.D.; Mulcahey, T.P. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207-31: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009901. Source: OSTI; NTIS; INIS; GPO Dep.

Pyrochemical processing as a means for conditioning spent nuclear fuels for disposal offers significant advantages over the direct disposal option. The advantages include reduction in high-level waste volume; conversion of most of the high-level waste to a low-level waste in which nearly all the transuranics (TRU) have been removed; and incorporation of the TRUs into a stable, highly radioactive waste form suitable for interim storage, ultimate destruction, or repository disposal. The lithium process has been under

development at Argonne National Laboratory for use in pyrochemical conditioning of spent fuel for disposal. All of the process steps have been demonstrated in small-scale (0.5-kg simulated spent fuel) experiments. Engineering-scale (20-kg simulated spent fuel) demonstration of the process is underway, and small-scale experiments have been conducted with actual spent fuel from a light water reactor (LWR). The lithium process is simple, operates at relatively low temperatures, and can achieve high decontamination factors for the TRU elements. Ordinary materials, such as carbon steel, can be used for process containment.

2378 (ANL/CMT/CP-84355) Pyrochemical processing of DOE spent nuclear fuel. Laidler, J.J. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207-23: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95005872. Source: OSTI; NTIS; INIS; GPO Dep.

A compact, efficient method for conditioning spent nuclear fuel is under development. This method, known as pyrochemical processing, or "pyroprocessing," provides a separation of fission products from the actinide elements present in spent fuel and further separates pure uranium from the transuranic elements. The process can facilitate the timely and environmentally-sound treatment of the highly diverse collection of spent fuel currently in the inventory of the United States Department of Energy (DOE). The pyroprocess utilizes elevated-temperature processes to prepare spent fuel for fission product separation; that separation is accomplished by a molten salt electrorefining step that provides efficient (>99.9%) separation of transuranics. The resultant waste forms from the pyroprocess, are stable under envisioned repository environment conditions and highly leach-resistant. Treatment of any spent fuel type produces a set of common high-level waste forms, one a mineral and the other a metal alloy, that can be readily qualified for repository disposal and avoid the substantial costs that would be associated with the qualification of the numerous spent fuel types included in the DOE inventory.

2379 (ANL/EA/CP-85662) Hazardous waste transportation risk assessment: Benefits of a combined deterministic and probabilistic Monte Carlo approach in expressing risk uncertainty. Polcastro, A.J. (Argonne National Lab., IL (United States)); Lazaro, M.A.; Cowen, M.A.; Hartmann, H.M.; Dunn, W.E.; Brown, D.F. Argonne National Lab., IL (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-126: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009888. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a combined deterministic and probabilistic methodology for modeling hazardous waste transportation risk and expressing the uncertainty in that risk. Both the deterministic and probabilistic methodologies are aimed at providing tools useful in the evaluation of alternative management scenarios for US Department of Energy (DOE) hazardous waste treatment, storage, and disposal (TSD). The probabilistic methodology can be used to provide perspective on and quantify uncertainties in deterministic predictions. The methodology developed has been applied to 63 DOE shipments made in fiscal year 1992, which contained poison by inhalation chemicals that represent an inhalation risk to the public. Models have been applied to simulate shipment routes, truck accident rates, chemical

spill probabilities, spill/release rates, dispersion, population exposure, and health consequences. The simulation presented in this paper is specific to trucks traveling from DOE sites to their commercial TSD facilities, but the methodology is more general. Health consequences are presented as the number of people with potentially life-threatening health effects. Probabilistic distributions were developed (based on actual item data) for accident release amounts, time of day and season of the accident, and meteorological conditions.

2380 (ANL/ER/CP-83078) In situ measurement of volatile organic compounds in groundwater by methods coupled to the cone penetrometer. Doskey, P.V. (Argonne National Lab., IL (United States). Environmental Research Div.); Aldstadt, J.H.; Kuo, J.M.; Costanza, M.S.; Erickson, M.D. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950209-2: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE95008269. Source: OSTI; NTIS; GPO Dep.

The objective of this investigation is to interface an in situ, on-line sparging system with a cone penetrometer to provide direct analysis of volatile organic compounds (VOCs) in groundwater by on-site analysis. Transfer line materials (15 m x 0.160-0.216 cm ID) composed of stainless steel, nickel, aluminum and Teflon®PFA, PTFE, and FEP were evaluated for their ability to quantitatively transfer chloroform, 1,1,1-trichloroethane, carbon tetrachloride, tetrachloroethylene, n-hexane, benzene, toluene, and o-xylene in the gas phase. The water content of the gas stream had an insignificant effect on the quantitative transfer of VOCs through Teflon® tubing but was critical to quantitative transfer of the compounds through metal tubing, particularly for nickel. Transfer efficiencies for all 7 analytes in moist gas streams through stainless steel tubing were greater than 95%. Toluene, tetrachloroethylene, and o-xylene were transferred with 93, 81 and 80% efficiency, respectively when drawn through Teflon®PFA tubing at 25 C. The sorption of these VOCs by Teflon® tubing was reversible and their transfer efficiencies improved to 94% when the tubing was flushed with 16 equivalent volumes of air. In general, the retention of the VOCs by Teflon® increased with decreasing aqueous solubility of the analyte. The efficiency at which VOCs were sparged from aqueous standards in Teflon®PFA, Type 304 stainless steel, and glass vessels were similar.

2381 (ANL/ER/CP-83877) Radiochemical method development. Erickson, M.D.; Aldstadt, J.H.; Alvarado, J.S.; Crain, J.S.; Orlandini, K.A.; Smith, L.L. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9406250-1: Conference on hazardous waste remediation, Bozeman, MT (United States), 8-10 Jun 1994). Order Number DE94018378. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have developed methods for chemical characterization of the environment under a multitask project that focuses on improvement of radioanalytical methods with an emphasis on faster and cheaper routine methods. The authors have developed improved methods for separation of environmental levels of technetium-99, radium, and actinides from soil and water; separation of actinides from soil and water matrix interferences; and isolation of strontium. They are also developing methods for simultaneous detection of multiple isotopes (including nonradionuclides) by

using a new instrumental technique, inductively coupled plasma-mass spectrometry (ICP-MS). The new ICP-MS methods have greater sensitivity and efficiency and could replace many radiometric techniques. They are using flow injection analysis to integrate and automate the separation methods with the ICP-MS methodology. The final product of all activities will be methods that are available (published in the U.S. Department of Energy's analytical methods compendium) and acceptable for use in regulatory situations.

2382 (ANL/ER/CP-84530) Faster, cheaper radioanalytical methods. Erickson, M.D.; Aldstadt, J.H.; Alvarado, J.S.; Crain, J.S.; Orlandini, K.A.; Smith, L.L. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216-115: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009913. Source: OSTI; NTIS; INIS; GPO Dep.

This project focuses on improvement of radioanalytical methods, with an emphasis on faster and cheaper routine methods. The authors have developed improved methods for the separation of environmental levels of technetium-99, radium, and actinides from soil and water; separation of actinides from soil and water matrix interferences; and isolation of strontium. Among the novel techniques for separation that are being used are element and class-specific resins and membranes. The authors have also developed methods for the simultaneous detection of multiple isotopes by using inductively coupled plasma-mass spectrometry (ICP-MS). Because of its mass-selective mode of detection, ICP-MS requires less rigorous chemical separations than does radiochemical analysis. In addition, improvements in the limits of detection, the volume of the sample and the time of analysis were obtained by using other techniques of sample introduction, such as ultrasonic nebulization, automated batch separation and electrothermal vaporization. Investigation of integration and automation of the separation methods with the ICP-MS method using flow injection analysis is underway. A solid scintillation device has been developed and tested for measurement and identification of low-energy beta-emitting radionuclides; application of this technique will eliminate the generation of mixed-waste counting cocktails. The final product of all activities will be methods that are available and are acceptable for use in regulatory situations. Concerted efforts are being made to facilitate implementation of the methods at DOE sites to realize the improvements offered.

2383 (ANL/ER/TM-3) Performance specifications for technology development: Application for characterization of volatile organic compounds in the environment. Carpenter, S.E.; Doskey, P.V.; Erickson, M.D.; Lindahl, P.C. Argonne National Lab., IL (United States). Jul 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94016627. Source: OSTI; NTIS; GPO Dep.

This report contains information about technology development for the monitoring and remediation of environmental pollution caused by the release of volatile organic compounds. Topics discussed include: performance specification processes, gas chromatography, mass spectrometer, fiber-optic chemical sensors, infrared spectroscopy, Raman spectroscopy, piezoelectric sensors and electrochemical sensors. These methods are analyzed for their cost efficiency, accuracy, and the ability to meet the needs of the customer.

2384 (ANL/IPNS/CP-85110) **The structure of lead-indium phosphate glass.** Suzuya, K. (Argonne National Lab., IL (United States)); Price, D.L.; Loong, C.K.; Sales, B.C.; Boatner, L.A. Argonne National Lab., IL (United States). Dec 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144-58: Fall meeting of the Materials Research Society, Boston, MA (United States), 28 Nov - 2 Dec 1994). Order Number DE95007130. Source: OSTI; NTIS; GPO Dep.

Lead-indium phosphate glasses exhibit a number of useful properties such as a high index-of-refraction, low preparation temperature and melt viscosity, and good chemical durability. The structure of such a glass (composition in wt. %: 65 PbO, 29 P₂O₅, 6 In₂O₃) has been investigated by total neutron scattering using the GLAD diffractometer at Argonne's spallation neutron source IPNS. Peaks corresponding to the P-O, Pb-O/In-O, and O-O pairs were observed in the radial distribution function. The short-range structure in the glass, in terms of average coordination numbers and bond distances, is compared with those of a pure P₂O₅ glass and with the crystal structure of lead pyrophosphate, Pb₂P₂O₇. Unlike silicate glasses in which the SiO₄ tetrahedra form a 3-dimensional network, the PO₄ tetrahedra in phosphate glasses form a chain-like structure. The structural modification by the lead cations in phosphate glasses appears to occur mainly in the medium range-affecting the lengths and connectivity of the chain-like structure.

2385 (BHI-00007) **Prototype Hanford Surface Barrier: Design basis document.** Myers, D.R.; Duranceau, D.A. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1994. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95005256. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Surface Barrier Development Program (BDP) was organized in 1985 to develop the technology needed to provide a long-term surface barrier capability for the Hanford Site and other arid sites. This document provides the basis of the prototype barrier. Engineers and scientists have momentarily frozen evolving barrier designs and incorporated the latest findings from BDP tasks. The design and construction of the prototype barrier has required that all of the various components of the barrier be brought together into an integrated system. This integration is particularly important because some of the components of the protective barrier have been developed independently of other barrier components. This document serves as the baseline by which future modifications or other barrier designs can be compared. Also, this document contains the minutes of meeting convened during the definitive design process in which critical decisions affecting the prototype barrier's design were made and the construction drawings.

2386 **Advances in the study of far-field phenomena affecting repository performance.** Tsang, C.F. (Lawrence Berkeley Lab., CA (United States)). pp. 885-894 of High Level Radioactive Waste Management. Proceedings, Volume 2. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 895 DOE Contract AC03-76SF00098. From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

Studies of far-field phenomena affecting repository performance have focused on the role of fractures and other

heterogeneities in the potential transport of radioactive solutes from the repository to the biosphere. The present paper summarizes two recent advances in the subject: The channeling model for the understanding and analysis of tracer transport in variable-aperture fractures and the modeling of coupled thermo-hydro-mechanical processes in geologic formation around a repository. The paper concludes with remarks on the need for duality in the approach to performance assessment. One line of the duality is fundamental studies and the other, goal-oriented assessment to satisfy regulatory requirements.

2387 **An electrochemical approach to predicting corrosion performance of container materials.** McCright, R.D. (Lawrence Livermore National Lab., CA (United States)); Farmer, J.C.; Fleming, D.L. pp. 940-944 of High Level Radioactive Waste Management. Proceedings, Volume 2. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 895 DOE Contract W-7405-ENG-48. From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

The pitting potentials of nickel-rich Alloy 825 are measured in chloride-containing solutions at different temperatures and adjusted to different pH values. The pitting potentials were determined by potentiodynamic polarization of Alloy 825 test specimens from the corrosion potential until a sharp increase in the electrochemical current indicated a breakdown of the protective passive film on the metal surface. Results show that Alloy 825 is susceptible to pitting attack in aggressive electrolytes containing more than 10,000 ppm chloride at 90°C and acidified to a pH value less than 2.5.

2388 **Scoping experimental analysis of factors affecting cask contamination weeping.** Bennett, P.C. (Sandia National Labs., Albuquerque, NM (United States)); Rutherford, B.M.; Kunze, J.F. pp. 1248-1255 of High Level Radioactive Waste Management. Proceedings, Volume 2. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 895 DOE Contract AC04-76DP00789. From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

One issue of particular concern to both the US Nuclear Regulatory Commission (NRC) and the US DOE involves the control of in-transit weeping of surface contamination on pool-loaded spent fuel transportation tasks. Effective prevention requires an understanding of the physical processes and the determination of related parameters which contribute to the weeping phenomenon. A program is underway at Sandia National Laboratories (SNL) to experimentally address these issues. The first set of experiments, reported herein, concentrated on inducing weeping, isolating and identifying the contaminants, and investigating macroscopic variables which might affect weeping. A second series of tests is underway to characterize bonding and release mechanisms, and to suggest effective means of decontamination.

2389 **Comparison of elastic and inelastic analysis and test results for the defense high level waste shipping cask.** Zimmer, A. (General Atomics, San Diego, CA (United States)); Koploy, M.A.; Madsen, M.M. pp. 1271-1278 of High Level Radioactive Waste Management. Proceedings, Volume 2. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 895 DOE

Contract AC04-80SF10791 ; AC04-76DP00789. From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

In the early 1980s, the US DOE/Defense Programs (DOE/DP) initiated a project to develop a safe and efficient transportation system for defense high level waste (DHLW). A long-standing objective of the DHLW transportation project is to develop a truck cask that represents the leading edge of cask technology as well as fully complies with all applicable DOE, Nuclear Regulatory Commission, and DOT regulations. General Atomics designed the DHLW Truck Shipping Cask using state-of-the-art analytical techniques verified by model testing performed by Sandia National Labs. (SNL). The analytical techniques include two approaches, inelastic analysis and elastic analysis. This paper will compare the results of the two analytical approaches and with model testing results. The purpose of this work is to provide data to support licensing of the DHLW cask and to support the acceptance by the NRC of inelastic analysis as a tool in packaging design and licensing.

2390 Apparent and simple diffusion coefficients in compacted bentonite. Conca, J.L. (Washington State Univ. Tri-Cities, Richland, WA (United States)); Ashida, T.; Sato, H. pp. 1382-1389 of High Level Radioactive Waste Management. Proceedings, Volume 2. American Society of Civil Engineers, New York, NY (United States) (1991). pp. 895 From 2. annual American Nuclear Society (ANS) international high level radioactive waste management conference; Las Vegas, NV (United States); 28 Apr - 3 May 1991.

Diffusion coefficients were experimentally determined in bentonite to evaluate the effectiveness of bentonite layers as a diffusion barrier to ionic transport away from high-level radioactive waste packages. The electrical conductivity was measured using a 1kHz conductivity bridge on bentonite-NaCl solution samples packed into conductivity cells. The diffusion coefficient was calculated from the electrical conductivity value using the Nerst-Einstein equation. These results were compared to apparent diffusion coefficients obtained using long-term, tracer diffusion tests in the same compacted bentonite with ^3H , ^{129}I , ^{90}Tc , ^{241}Am , ^{90}Sr , ^{137}Cs and ^{237}Np . As expected, the retardation effects were much lower than predicted from batch tests, and the retardation behavior of all species changed with increasing compaction density. ^{90}Sr , ^{137}Cs and ^{237}Np behave especially non-linearly at high compaction densities.

2391 Drift emplaced waste package thermal response. Ruffner, D.J. (Lawrence Livermore National Lab., CA (United States)); Johnson, G.L.; Platt, E.A.; Bink, J.A.; Doering, T.W. pp. 538-543 of High Level Radioactive Waste Management: Proceedings. Volume 1. American Nuclear Society, Inc., La Grange Park, IL (United States) (1993). pp. 1115 DOE Contract W-7405-ENG-48. From 10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993.

Thermal calculations of the effects of radioactive waste decay heat on the potential repository at Yucca Mountain, Nevada, have been conducted by the Yucca Mountain Site Characterization Project (YMP) at Lawrence Livermore National Lab. (LLNL) in conjunction with the B&W Fuel Co. For a number of waste package spacings, these 3D transient calculations use the TOPAZ3D code to predict drift wall temperatures to 10,000 years following emplacement. Systematic temperature variation occurs as a function of fuel age at emplacement and Areal Mass Loading (AML) during

the first few centuries after emplacement. After about 1000 years, emplacement age is not a strong driver on rock temperature; AML has a larger impact. High AMLs occur when large waste packages are emplaced end-to-end in drifts. Drift emplacement of equivalent packages results in lower rock temperatures than borehole emplacement. For an emplacement scheme with 50% of the drift length occupied by packages, an AML of 138 MTU/acre is about three times higher than the Site Characterization Plan-Conceptual Design (SCP-CD) value. With this higher AML (requiring only 1/3 of the SCP-CD repository footprint), peak drift wall temperatures do not exceed 160°C, but rock temperatures exceed the boiling point of water for about 3000 years. These TOPAZ3D results have been compared with reasonable agreement with two other computer codes.

2392 A concept to combine DOE waste minimization goals with commercial utility needs for a universal container system for spent nuclear fuel storage, transportation, and disposal. Falci, F.P. (DOE, Washington, DC (United States)); Smith, M.L.; Sorenson, K.B. pp. 832-840 of High Level Radioactive Waste Management: Proceedings. Volume 1. American Nuclear Society, Inc., La Grange Park, IL (United States) (1993). pp. 1115 From 10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993.

The concept of storing, transporting, and disposing of spent fuel using a single package has obvious advantages. Coupling this concept with using contaminated scrap metal from the EM Complex will help reduce a significant portion of waste that would otherwise need to be packaged, stored, and disposed of as low level radioactive waste. Assuming a material of cost of \$1 per pound for 800,000 tons of metal needed for universal containers, the potential material cost savings from manufacturing these containers from what would otherwise be a waste product is about \$1.5 billion. Clearly, this concept is novel and has significant obstacles that need to be addressed and overcome; particularly in the regulatory arena. However, the potential benefits warrant the evaluation of the proposal on several fronts. DOE OCRWM should seriously consider the universal cask concept for management of spent fuel. DOE EM should pursue the development of melting contaminated scrap for the manufacture of casks. Finally, EM and OCRWM should cooperate on the evaluation of using EM contaminated scrap metal for the manufacture of universal casks for OCRWM spent fuel.

2393 Disposal of defense spent fuel and HLW from the Idaho Chemical Processing Plant. Ermold, L.F. (Westinghouse Idaho Nuclear Company, Inc., Idaho Falls, ID (United States)); Loo, H.H.; Klingler, R.D.; Herzog, J.D.; Knecht, D.A. pp. 1200-1206 of High Level Radioactive Waste Management: Proceedings. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1993). pp. 1090 DOE Contract AC07-84ID12435. From 10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993.

Acidic high-level radioactive waste (HLW) resulting from fuel reprocessing at the Idaho Chemical Processing Plant (ICPP) for the U.S. Department of Energy (DOE) has been solidified to a calcine since 1963 and stored in stainless steel bins enclosed by concrete vaults. Several different types of unprocessed irradiated DOE-owned fuels are also in storage at the ICPP. In April, 1992, DOE announced that spent fuel would no longer be reprocessed to recover enriched uranium and called for a shutdown of the reprocessing facilities at the ICPP. A new Spent Fuel and HLW

Technology Development program was subsequently initiated to develop technologies for immobilizing ICPP spent fuels and HLW for disposal, in accordance with the Nuclear Waste Policy Act. The Program elements include Systems Analysis, Graphite Fuel Disposal, Other Spent Fuel Disposal, Sodium-Bearing Liquid Waste Minimization. This paper presents an overview of the ICPP radioactive wastes and current spent fuels, with an emphasis on the description of HLW and spent fuels requiring repository disposal.

2394 Durability testing of the high-capacity GA-4/GA-9 trailer. Zimmer, A. (General Atomics, San Diego, CA (United States)). pp. 2097-2099 of High Level Radioactive Waste Management: Proceedings: Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1993). pp. 1090 From 10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993.

General Atomics (GA) is under contract to the US Department of Energy (DOE), Idaho Field Office, to develop two legal-weight truck from-reactor spent-fuel shipping casks with trailers. GA is developing these high-capacity transport systems to support the Office of Civilian Radioactive Waste Management's (OCRWM) mission to transport spent fuel from reactors to a permanent disposal site. GA's goal is to maximize the number of fuel assemblies that the transport system can safely carry. The GA-4 Cask is being designed to transport four pressurized-water-reactor (PWR) spent-fuel assemblies. The use of these high-capacity transport systems will have a large benefit to public safety since the number of legal-weight truck shipments will be reduced by at least a factor of four over existing spent-fuel shipping cask systems. Achieving these capacities requires that the weight of each component of the transport system, i.e., cask, trailer and tractor, be minimized. The weight of the trailer is of particular importance. With a high load-to-weight ratio, the durability and reliability of the trailer become significant factors in the success of the transport system. In order to verify that the trailer design will meet the durability and performance requirements to safely transport spent-fuel, GA has planned an extensive testing program. The testing program includes non-destructive examination (NDE) of the trailer welds, operational testing, and a test to verify the durability of the trailer up to its 1,000,000-mile design life. Since a prototype cask will not be available for the testing, GA designed and built a dummy payload that simulates the correct weight distribution and approximates the dynamic response of the prototype cask.

2395 (CONF-930873-, pp. 5.2.1-5.2.7) Multimodality characterization of nuclear waste drums using emerging techniques for nondestructive examination and assay. Bernardi, R.T. (Bio-Imaging Research Inc., Lincolnshire, IL (United States)). American Society of Mechanical Engineers, New York, NY (United States). Mixed Waste Committee; Temple Univ., Philadelphia, PA (United States). Dept. of Environmental Safety and Health. [1993]. DOE Contract FG02-90ER80893. From 2. international mixed waste symposium; Baltimore, MD (United States); 17-20 Aug 1993. In *Mixed waste: Proceedings*. 817p. Order Number DE94012383. Source: OSTI; NTIS; INIS; GPO Dep.

We are developing an x-ray imaging system that incorporates several inspection technologies for complete, nondestructive evaluation of containers of nuclear waste. In Phase I and Phase II SBIR programs for the DOE, we proved the feasibility of using x-ray computed tomography (CT) and digital radiography (DR)-imaging techniques using

x-rays transmitted through the object-for-container inspection. Now, with further funding from DOE and working with scientists at Lawrence Livermore National Lab., we are designing a mobile inspection system that will use CT and DR as well as two x-ray emission imaging techniques-single photon emission computed tomography and nondestructive assay. This system will provide much more information about the contents of containers than currently used inspection methods, and will provide archiving of digital data. In this paper, we describe inspection system and present recent results from the CT and DR evaluations.

2396 (CONF-940225-122) Acoustic emission sensor radiation damage threshold experiment. Beeson, K.M. (Stoller (S.M.) Corp., Oak Ridge, TN (United States)); Pepper, C.E. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94017756. Source: OSTI; NTIS; INIS; GPO Dep.

Determination of the threshold for damage to acoustic emission sensors exposed to radiation is important in their application to leak detection in radioactive waste transport and storage. Proper response to system leaks is necessary to ensure the safe operation of these systems. A radiation impaired sensor could provide "false negative or false positive" indication of acoustic signals from leaks within the system. Research was carried out in the Radiochemical Technology Division at Oak Ridge National Laboratory to determine the beta/gamma radiation damage threshold for acoustic emission sensor systems. The individual system consisted of an acoustic sensor mounted with a two-part epoxy onto a stainless steel waveguide. The systems were placed in an irradiation fixture and exposed to a Cobalt-60 source. After each irradiation, the sensors were recalibrated by Physical Acoustics Corporation. The results were compared to the initial calibrations performed prior to irradiation and a control group, not exposed to radiation, was used to validate the results. This experiment determines the radiation damage threshold of each acoustic sensor system and verifies its life expectancy, usefulness and reliability for many applications in radioactive environments.

2397 (CONF-940386-4) Decision analysis applications and the CERCLA process. Purucker, S.T. (Oak Ridge National Lab., TN (United States). Risk Analysis Section); Lyon, B.F. Oak Ridge National Lab., TN (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Cost efficient acquisition and utilization of data in the management of hazardous waste sites; Herndon, VA (United States); 23-25 Mar 1994. Order Number DE94013253. Source: OSTI; NTIS; GPO Dep.

Quantitative decision methods can be developed during environmental restoration projects that incorporate stakeholder input and can complement current efforts that are undertaken for data collection and alternatives evaluation during the CERCLA process. These decision-making tools can supplement current EPA guidance as well as focus on problems that arise as attempts are made to make informed decisions regarding remedial alternative selection. In examining the use of such applications, the authors discuss the use of decision analysis tools and their impact on collecting data and making environmental decisions from a risk-based perspective. They will look at the construction of objective functions for quantifying different risk-based perspective.

They will look at the construction of objective functions for quantifying different risk-based decision rules that incorporate stakeholder concerns. This represents a quantitative method for implementing the Data Quality Objective (DQO) process. These objective functions can be expressed using a variety of indices to analyze problems that currently arise in the environmental field. Examples include cost, magnitude of risk, efficiency, and probability of success or failure. Based on such defined objective functions, a project can evaluate the impact of different risk and decision selection strategies on data worth and alternative selection.

2398 (CONF-940433-8) **Expert systems for the transportation of hazardous and radioactive materials.** Luce, C.E.; Clover, J.C.; Ferrada, J.J. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Spring meeting of the American Institute of Chemical Engineers; Atlanta, GA (United States); 17-21 Apr 1994. Order Number DE95000486. Source: OSTI; NTIS; INIS; GPO Dep.

Under the supervision of the Transportation Technologies Group which is in the Chemical Technology Division at Oak Ridge National Laboratory, an expert system prototype for the transportation and packaging of hazardous and radioactive materials has been designed and developed. The development of the expert system prototype focused on using the combination of hypermedia elements and the Visual Basic™ programming language. Hypermedia technology uses software that allows the user to interact with the computing environment through many formats: text, graphics, audio, and full-motion video. With the use of hypermedia, a user-friendly prototype has been developed to sort through numerous transportation regulations, thereby leading to the proper packaging for the materials. The expert system performs the analysis of regulations that an expert in shipping information would do; only the expert system performs the work more quickly. Currently, enhancements in a variety of categories are being made to the prototype. These include further expansion of non-radioactive materials, which includes any material that is hazardous but not radioactive; and the addition of full-motion video, which will depict regulations in terms that are easy to understand and which will show examples of how to handle the materials when packaging them.

2399 **Thermal performance of a depleted uranium shielded storage, transportation, and disposal package.** Wix, S.D. (Gram, Inc., Albuquerque, NM (United States)); Yoshimura, H.R. pp. 877-881 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 DOE Contract AC04-94AL85000. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

The US Department of Energy (DOE) is responsible for management and disposal of large quantities of depleted uranium (DU) in the DOE complex. Viable economic options for the use and eventual disposal of the material are needed. One possible option is the use of DU as shielding material for vitrified Defense High-Level Waste (DHLW) storage, transportation, and disposal packages. Use of DU as a shielding material provides the potential benefit of disposing of significant quantities of DU during the DHLW storage and disposal process. Two DU package concepts have been developed by Sandia National Laboratories. The first concept

is the Storage/Disposal plus Transportation (S/D+T) package. The S/D+T package consists of two major components: a storage/disposal (S/D) container and a transportation overpack. The second concept is the S/D/T package which is an integral storage, transportation, and disposal package. The package concept considered in this analysis is the S/D+T package with seven DHLW waste canisters.

2400 **Fabrication options for depleted uranium components in shielded containers.** Derrington, S.B. (Oak Ridge Y-12 Plant, TN (United States)); Thompson, J.E.; Coates, C.W. pp. 942-948 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 DOE Contract AC05-84OR21400. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

Depleted uranium (DU) is an attractive material for the gamma-shielding components in containers designed for the storage, transport, and disposal of high-level radioactive wastes or spent nuclear fuel. The size and weight of these components present fabrication challenges. A broad range of technical expertise, capabilities, and facilities for uranium manufacturing and technology development exist at the Department of Energy laboratories and production facilities and within commercial industry. Several cast and wrought processes are available to fabricate the DU components. Integration of the DU fabrication capabilities and physical limitations for handling the DU components into the early design phase will ensure a fabricable product.

2401 **Dry storage and transportation of failed fuel.** Quinn, R.D. (VECTRA Fuel Services, San Jose, CA (United States)); Thomas, B.D. pp. 949-954 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

US commercial nuclear power generating facilities currently store discharged nuclear fuel in pools located at the utility site. This inventory includes both normal fuel and "failed fuel" which has been damaged or is in some way irregular. Since there is a growing need for onsite dry storage and offshore shipping of discharged nuclear fuel, a need has also arisen for containers capable of handling this failed fuel safely and economically. Sacramento Municipal Utility District's (SMUD's) Rancho Seco plant, which was shut down in 1990, is the first utility to plan a comprehensive program to dry store, and eventually ship offsite, failed fuel assemblies. The design of these special canisters is presented along with a description of their use and ultimate shipment to the repository or Monitored Retrievable Storage Facility (MRS).

2402 **Rationale for determining spent fuel acquisitions for repository testing.** Marschman, S.C. (Pacific Northwest Lab., Richland, WA (United States)); Einziger, R.E.; Stout, R.B. pp. 1074-1079 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 2. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 862 DOE Contract AC06-76RL01830. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

A rationale for selecting commercial spent nuclear fuels for use as testing materials for the Yucca Mountain Project was developed. A review of experimental data from fuel performance testing was conducted and performance-affecting attributes pertinent to storage and disposal conditions were identified. These were used to form the basis for a fuel-selection strategy designed to ensure adequate and representative samples are available for storage- and disposal-relevant testing.

2403 Performance assessment model of a single waste package. O'Connell, W.J. (Lawrence Livermore National Lab., CA (United States)); Ueng, T.S.; Lewis, L.C. pp. 1188-1194 of High Level Radioactive Waste Management: Proceedings of the fifth annual international conference. Volume 3. American Nuclear Society, Inc., La Grange Park, IL (United States) (1994). pp. 699 DOE Contract W-7405-ENG-48. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994.

PANDORA-1.1 is a system model for the mobilization and release of radionuclides from a spent nuclear fuel disposal package. Earlier processes affecting release are represented by input tables. Several groundwater contact alternatives and spent fuel constituents lead to different release-rate behaviors and controlling parameters. Rate control is provided by a product of parameters from hydrology, design, and/or geochemistry/waste form interaction parameters. The program is designed to accommodate evolving requirements such as a wider range of hydrological input values. A computerized configuration management system automates much of the change control process.

2404 (CONF-9408112-1) Motivations for the introduction of new environmental technology. Palmer, J.R. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 10. Oak Ridge model conference on waste management and environment restoration; Oak Ridge, TN (United States); 23-25 Aug 1994. Order Number DE94019150. Source: OSTI; NTIS; INIS; GPO Dep.

While I am not a social scientist or psychologist, it is my personal observation that there are three principal motives which cause companies (and also individuals) to contribute to the common good of society. These three motives are love, fear, and greed. Of course companies and people are motivated toward positive action by many other factors such as survival, hunger, and motivated by other negative factors such as hate and revenge, but with respect to taking actions which benefit persons other than themselves, I contend that the principal factors which motivate such behavior are the three cited. Before proceeding further, let me point out that while the term "greed" has a lot of negative connotations associated with it, it can be a strong driving force for the common good. Our treasured capitalistic economic system is based upon it. Of course greed can also be a strong driving force for social destruction. Monopolies and dictatorships are also based upon greed. The trick therefore is to extract the potential social benefits from greed without causing it to turn upon the society and devour it. While I could use a more euphemistic term than greed, such as "profit motive", to describe this motivating factor, I have chosen to stick with the term "greed" because it cuts to the level of basic human instincts, and it adds some spice to an otherwise dull subject. Let me also assure you that I am not using the term in a cynical manner. I believe that it can be a very positive

force (in fact, I contend, the most effective force) in promoting the introduction of new environmental technology. But, before getting into that, let us first examine the role of the other two motives for maximizing the common environmental good: love and fear.

2405 (CONF-941088-1) Evolution of patterns of regional groundwater flow in southeastern New Mexico: Response to post-Pleistocene changes in climate. Corbet, T.F. Sandia National Labs., Albuquerque, NM (United States). [1994]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. From Annual meeting of the Geological Society of America; Seattle, WA (United States); 24-27 Oct 1994. Order Number DE95005963. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a potential repository for transuranic wastes generated by defense programs of the US Department of Energy. The repository site is located 42 km east of the city of Carlsbad, New Mexico in a thick, Permian-age deposit of bedded salt. One consideration in evaluating the performance of the repository is that a future society might inadvertently penetrate the repository with one or more drill holes. Given certain circumstances, these holes could provide a pathway for contaminated brine to move upward into relatively permeable strata located above the bedded salt. There is concern that flowing groundwater could then transport radionuclides laterally to the sub-surface portion of the accessible environment, currently defined by the disposal regulations as the region more than 5 kilometers from the radioactive waste. The simulations presented here are part of a numerical modeling study of the possible impact that a change in climate over the next 10,000 years could have on the pattern of groundwater flow and, consequently, on the migration of radionuclides in strata overlying the repository.

2406 (CONF-941144-107) Performance of cement-based seal-system components in a waste-disposal environment. Malone, P.G. (US Army Engineer Waterways Experiment Station, Vicksburg, MS (United States)); Wakeley, L.D.; Burkes, J.P.; McDaniel, E.W. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI05-90OR21921. From Fall meeting of the Materials Research Society; Boston, MA (United States); 28 Nov - 2 Dec 1994. Order Number DE95008840. Source: OSTI; NTIS; INIS; GPO Dep.

A grout based on portland cement, Class F fly ash, and bentonite clay was developed as part of the closure system of shallow subsurface structures for disposal of low-activity radioactive wastes. Heat output, volume change, and compressive strength of the sealing grout were monitored with time, at elevated temperature, and in physical models, to determine if this closure grout could maintain adequate volume stability and other required physical properties in the internal environment of the disposal structure. To determine if contact with an alkaline liquid waste would cause chemical deterioration of the sealing grout, cured specimens were immersed in a liquid waste simulant containing high concentrations of sodium and aluminum salts. After 21 days at 60 C, specimens increased in mass without significant changes in volume. XRD revealed crystallization of sodium aluminum silicate hydrate. The new phase has an XRD pattern similar to the commercial synthetic zeolite Losod. Scanning electron microscopy used with x-ray fluorescence showed that clusters of this phase had formed in grout pores, to increase grout density and decrease its effective porosity. Testing was

repeated at 100 C for 5 days using a simulant containing sodium hydroxide and aluminum nitrate and results were similar. Physical and chemical tests indicate acceptable performance of this grout as a seal-system component.

2407 (CONF-941207-20) Issues relating to spent nuclear fuel storage on the Oak Ridge Reservation. Klein, J.A.; Turner, D.W. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994. Order Number DE95006386. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, about 2,800 metric tons of spent nuclear fuel (SNF) is stored in the US, 1,000 kg of SNF (or about 0.03% of the nation's total) are stored at the US Department of Energy (DOE) complex in Oak Ridge, Tennessee. However small the total quantity of material stored at Oak Ridge, some of the material is quite singular in character and, thus, poses unique management concerns. The various types of SNF stored at Oak Ridge will be discussed including: (1) High-Flux Isotope Reactor (HFIR) and future Advanced Neutron Source (ANS) fuels; (2) Material Testing Reactor (MTR) fuels, including Bulk Shielding Reactor (BSR) and Oak Ridge Research Reactor (ORR) fuels; (3) Molten Salt Reactor Experiment (MSRE) fuel; (4) Homogeneous Reactor Experiment (HRE) fuel; (5) Miscellaneous SNF stored in Oak Ridge National Laboratory's (ORNL's) Solid Waste Storage Areas (SWSAs); (6) SNF stored in the Y-12 Plant 9720-5 Warehouse including Health, Physics Reactor (HPRR), Space Nuclear Auxiliary Power (SNAP-) 10A, and DOE Demonstration Reactor fuels.

2408 (CONF-941244-1) Position paper on gas generation in the Waste Isolation Pilot Plant. Brush, L.H. USDOE Carlsbad Area Office, NM (United States). 15 Nov 1994. 111p. Sponsored by USDOE, Washington, DC (United States). From System prioritization method workshop; Carlsbad, NM (United States); 8-9 Dec 1994. Order Number DE95003738. Source: OSTI; NTIS; INIS; GPO Dep.

Gas generation by transuranic (TRU) waste is a significant issue because gas will, if produced in significant quantities, affect the performance of the Waste Isolation Pilot Plant (WIPP) with respect to Environmental Protection Agency (EPA) regulations for the long-term isolation of radioactive and chemically hazardous waste. If significant gas production occurs, it will also affect, and will be affected by, other processes and parameters in WIPP disposal rooms. The processes that will produce gas in WIPP disposal rooms are corrosion, microbial activity and radiolysis. This position paper describes these processes and the models, assumptions and data used to predict gas generation in WIPP disposal rooms.

2409 (CONF-941244-2-Rev.1) Actinide Source Term Program, position paper. Revision 1. Novak, C.F.; Papenguth, H.W.; Crafts, C.C.; Dhooze, N.J. USDOE Carlsbad Area Office, NM (United States). 15 Nov 1994. 35p. Sponsored by USDOE, Washington, DC (United States). From System prioritization method workshop; Carlsbad, NM (United States); 8-9 Dec 1994. Order Number DE95003737. Source: OSTI; NTIS; INIS; GPO Dep.

The Actinide Source Term represents the quantity of actinides that could be mobilized within WIPP brines and could migrate with the brines away from the disposal room vicinity. This document presents the various proposed methods for

estimating this source term, with a particular focus on defining these methods and evaluating the defensibility of the models for mobile actinide concentrations. The conclusions reached in this document are: the 92 PA "expert panel" model for mobile actinide concentrations is not defensible; and, although it is extremely conservative, the "inventory limits" model is the only existing defensible model for the actinide source term. The model effort in progress, "chemical modeling of mobile actinide concentrations", supported by a laboratory effort that is also in progress, is designed to provide a reasonable description of the system and be scientifically realistic and supplant the "Inventory limits" model.

2410 (CONF-941244-Summ.) Hazardous constituent source term. Revision 2. USDOE, Washington, DC (United States). 17 Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). From System prioritization method workshop; Carlsbad, NM (United States); 8-9 Dec 1994. Order Number DE95003736. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has several facilities that either generate and/or store transuranic (TRU)-waste from weapons program research and production. Much of this waste also contains hazardous waste constituents as regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA). Toxicity characteristic metals in the waste principally include lead, occurring in leaded rubber gloves and shielding. Other RCRA metals may occur as contaminants in pyrochemical salt, soil, debris, and sludge and solidified liquids, as well as in equipment resulting from decontamination and decommissioning activities. Volatile organic compounds (VOCs) contaminate many waste forms as a residue adsorbed on surfaces or occur in sludge and solidified liquids. Due to the presence of these hazardous constituents, applicable disposal regulations include land disposal restrictions established by Hazardous and Solid Waste Amendments (HSWA). The DOE plans to dispose of TRU-mixed waste from the weapons program in the Waste Isolation Pilot Plant (WIPP) by demonstrating no-migration of hazardous constituents. This paper documents the current technical basis for methodologies proposed to develop a post-closure RCRA hazardous constituent source term. For the purposes of demonstrating no-migration, the hazardous constituent source term is defined as the quantities of hazardous constituents that are available for transport after repository closure. Development of the source term is only one of several activities that will be involved in the no-migration demonstration. The demonstration will also include uncertainty and sensitivity analyses of contaminant transport.

2411 (CONF-950216-120) An expert system for enhancing compliance with hazardous materials packaging and transportation regulations. Ferrada, J.J. (Oak Ridge National Lab., TN (United States)); Michelhaugh, R.D.; Pope, R.B.; Rawl, R.R.; Thomas, T.M. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 Mar 1995. Order Number DE95010284. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Material Expert System (HaMTEs) was developed at ORNL in order to provide a computerized expert system which is easy to use, will provide straightforward and consistent application of the hazardous material transportation regulations, and will reduce the potential for human error in applying the regulations to both packaging

and transportation of hazardous material activities. The system's proof-of-concept was demonstrated using the radioactive material regulations and then expanded to include regulations for all hazardous materials. It incorporates as much as possible multi-media capabilities, for accessing A/V demonstrations of explanations and applications of regulations, descriptions of package designs, and actual loading and preparation for shipment of specific package designs. Coupling of HaMTES to other transportation operations management software is underway and methods for maintaining and upgrading the program developed. Details of the capabilities of HaMTES, its computer hardware requirements, and plans for implementing HaMTES within the DOE shipping community are presented in this paper.

2412 (DOE-0252) Marker development. Adams, M.R. Westinghouse Hanford Co., Richland, WA (United States). May 1987. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018688. Source: OSTI; NTIS; GPO Dep.

This report is to discuss the marker development for radioactive waste disposal sites. The markers must be designed to last 10,000 years, and place no undue burdens on the future generations. Barriers cannot be constructed that preclude human intrusion. Design specifications for surface markers will be discussed, also marker pictograms will also be covered.

2413 (DOE/AL/58309-55) Implications of the presence of petroleum resources on the integrity of the WIPP. Silva, M.K. (Environmental Evaluation Group, Albuquerque, NM (United States)). Environmental Evaluation Group, Albuquerque, NM (United States). Jun 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. (EEG-55). Order Number DE94014243. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a facility of the US Department of Energy (DOE), designed and constructed for the permanent disposal of transuranic (TRU) defense waste. The WIPP is surrounded by reserves of potash, crude oil, and natural gas. These are attractive targets for exploratory drilling which could disrupt the integrity of the transuranic waste repository. The performance assessment calculations published to date have identified future drilling for oil and gas reserves as an event that may disrupt the repository and may release radionuclides in excess of the standards. Therefore, the probability of inadvertent human intrusion into the repository by drilling and its impact on the integrity of the repository must be carefully assessed. This report evaluates: (1) the studies funded by the DOE to examine the crude oil potential in the immediate vicinity of the WIPP; (2) the use of an elicitation exercise to predict future drilling rates for use in the calculation of the repository performance; and (3) the observed limitations of institutional controls. This report identifies the following issues that remain to be resolved: (1) the limited performance of blowout preventers after drilling into high pressure zones immediately adjacent to the WIPP Site Boundary; (2) reported problems with waterflooding operations in southeastern New Mexico; (3) reported water level rises in several wells completed in the Rustler Formation, south of the WIPP Site, possibly due to oil and gas wells or leaking injection wells; and (4) reports of inadequate well abandonment practices on BLM leases and the continued absence of enforceable regulations.

2414 (DOE/AL/58309-56) Unresolved issues for the disposal of remote-handled transuranic waste in the

Waste Isolation Pilot Plant. Silva, M.K.; Neill, R.H. Environmental Evaluation Group, Albuquerque, NM (United States). Sep 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. (EEG-56). Order Number DE95000599. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Waste Isolation Pilot Plant (WIPP) is to dispose of 176,000 cubic meters of transuranic (TRU) waste generated by the defense activities of the US Government. The envisioned inventory contains approximately 6 million cubic feet of contact-handled transuranic (CH TRU) waste and 250,000 cubic feet of remote handled transuranic (RH TRU) waste. CH TRU emits less than 0.2 rem/hr at the container surface. Of the 250,000 cubic feet of RH TRU waste, 5% by volume can emit up to 1,000 rem/hr at the container surface. The remainder of RH TRU waste must emit less than 100 rem/hr. These are major unresolved problems with the intended disposal of RH TRU waste in the WIPP. (1) The WIPP design requires the canisters of RH TRU waste to be emplaced in the walls (ribs) of each repository room. Each room will then be filled with drums of CH TRU waste. However, the RH TRU waste will not be available for shipment and disposal until after several rooms have already been filled with drums of CH TRU waste. RH TRU disposal capacity will be lost for each room that is first filled with CH TRU waste. (2) Complete RH TRU waste characterization data will not be available for performance assessment because the facilities needed for waste handling, waste treatment, waste packaging, and waste characterization do not yet exist. (3) The DOE does not have a transportation cask for RH TRU waste certified by the US Nuclear Regulatory Commission (NRC). These issues are discussed along with possible solutions and consequences from these solutions. 46 refs.

2415 (DOE/AL/58309-57) An appraisal of the 1992 preliminary performance assessment for the Waste Isolation Pilot Plant. Lee, W.W.L. (Environmental Evaluation Group, Albuquerque, NM (United States)); Chaturvedi, L.; Silva, M.K.; Weiner, R.; Neill, R.H. Environmental Evaluation Group, Albuquerque, NM (United States); Environmental Evaluation Group, Carlsbad, NM (United States). Sep 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. (EEG-57). Order Number DE95000809. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the New Mexico Environmental Evaluation Group is to conduct an independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) Project to ensure the protection of the public health and safety and the environment. The WIPP Project, located in southeastern New Mexico, is being constructed as a repository for the disposal of transuranic (TRU) radioactive wastes generated by the national defense programs. The Environmental Evaluation Group (EEG) has reviewed the WIPP 1992 Performance Assessment (Sandia WIPP Performance Assessment Department, 1992). Although this performance assessment was released after the October 1992 passage of the WIPP Land Withdrawal Act (PL 102-579), the work preceded the Act. For individual and ground-water protection, calculations have been done for 1000 years post closure, whereas the US Environmental Protection Agency's Standards (40 CFR 191) issued in 1993 require calculations for 10,000 years. The 1992 Performance Assessment continues to assimilate improved understanding of the geology and hydrogeology of the site, and evolving conceptual models of natural barriers. Progress has been made towards assessing WIPP's compliance with the US Environmental Protection Agency's

Standards (40 CFR 191). The 1992 Performance Assessment has addressed several items of major concern to EEG, outlined in the July 1992 review of the 1991 performance assessment (Neill et al., 1992). In particular, the authors are pleased that some key results in this performance assessment deal with sensitivity of the calculated complementary cumulative distribution functions (CCDF) to alternative conceptual models proposed by EEG – that flow in the Culebra be treated as single-porosity fracture-flow; with no sorption retardation unless substantiated by experimental data.

2416 (DOE/AL/65779-T1) 1992 Annual performance report for Environmental Monitoring and Oversight at Department of Energy facilities in New Mexico. New Mexico Environment Dept., Santa Fe, NM (United States). [1992]. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-91AL65779. Order Number DE94010416. Source: OSTI; NTIS; INIS; GPO Dep.

In October 1990 an Agreement-in-Principle (AIP) was entered into between the US Department of Energy (DOE) and the State of New Mexico for the purpose of supporting State oversight activities at DOE facilities in New Mexico. The State's lead agency for the Agreement is the New Mexico Environment Department (NMED). DOE has agreed to provide the State with resources over a five year period to support State activities in environmental oversight, monitoring, access and emergency response to ensure compliance with applicable federal, state, and local laws at Los Alamos National Laboratory (LANL), Sandia National Laboratories (SNL), the Waste Isolation Pilot Plant (WIPP), and the Inhalation Toxicology Research Institute (ITRI). The Agreement is designed to assure the citizens of New Mexico that public health, safety and the environment are being protected through existing programs; DOE is in compliance with applicable laws and regulations; DOE has made substantial new commitments; cleanup and compliance activities have been prioritized; and a vigorous program of independent monitoring and oversight by the State is underway. This report relates the quality and effectiveness of the facilities' environmental monitoring and surveillance programs. This report satisfies that requirement for the January–December 1992 time frame.

2417 (DOE/CAO-941046) Performance-based waste acceptance criteria preliminary baseline assumptions. USDOE Carlsbad Area Office, NM (United States). 24 Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002262. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE's) strategy for the management of transuranic (TRU) and TRU mixed wastes has focused on the development of the Waste Isolation Pilot Plant (WIPP). The WIPP repository is designated to receive DOE defense wastes that meet the established criteria for acceptance. As a national strategy [DOE, 1993], DOE does not intend to treat candidate wastes unless treatment or processing are necessary to meet the safety, health, and regulatory criteria for transport and disposal at WIPP. The WIPP WAC has evolved over the past 10 years to include criteria and requirements in support of the Waste Characterization program and other related compliance programs. In aggregate, the final health, safety and regulatory criteria for the waste will be documented in the Disposal WAC. This document serves two purposes. First, it familiarizes regulators and stakeholders with the concept of performance based waste acceptance criteria as an augmentation within a final Waste Isolation Pilot Plant (WIPP) Waste Acceptance

Criteria. Second, the document preliminarily identifies certain waste characteristics that appear important to the performance assessment process for WIPP; therefore, these could become component characteristics in the Performance Based Waste Acceptance Criteria (PBWAC). Identification of the final PBWAC will be accomplished through iterative runs of the System Prioritization Method (SPM). These iterations will serve to more clearly isolate and identify those waste characteristics that directly and predominately impact on the performance assessment.

2418 (DOE/CH-9303) Applied research and development private sector accomplishments: Final summary report. Beskid, N.J.; Devgun, J.S.; Zielke, M.M.; Erickson, M.D. Argonne National Lab., IL (United States). Dec 1993. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007920. Source: OSTI; NTIS; GPO Dep.

Because of the nature of most US Department of Energy (DOE) operations, contamination at DOE sites presents complex problems. DOE sites may have radioactive, hazardous, or mixed contamination. The major contaminants include radionuclides, volatile organic compounds (VOCs), and heavy metals. The contamination exists in soils, groundwater, and buildings and materials. DOE's special problems in site remediation have created a need for better and less costly technologies. Thus, DOE has implemented several initiatives for developing new technologies. This report describes the results of the first set of procurement contracts in this area. Similar research and development (R&D) activities are currently managed for DOE by the Morgantown Energy Technology Center.

2419 (DOE/DP/48070-T1) [Board on Radioactive Waste Managements action on progress toward objectives]. National Research Council, Washington, DC (United States). 28 Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-89DP48070. Order Number DE95006395. Source: OSTI; NTIS; GPO Dep.

This report is a progress report to the US DOE from the Board on Radioactive Waste Management (BRWM), which summarizes the activities of the board during the period December 1, 1993 to May 2, 1994. The report summarizes the meetings of the board as a whole, of various of its subcommittees, and of activities it has undertaken to further its original mission. This board is associated with the National Research Council to give advice to US DOE.

2420 (DOE/EM-0156T) Characterization, Monitoring, and Sensor Technology Integrated Program (CMST-IP): Technology summary. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Apr 1994. 159p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014298. Source: OSTI; NTIS; INIS; GPO Dep.

The Characterization, Monitoring, and Sensor Technology Integrated Program seeks to deliver needed technologies, timely and cost-effectively, to the Office of Waste Management (EM-30), the Office of Environmental Restoration (EM-40), and the Office of Facility Transition and Management (EM-60). The scope of characterizations monitoring, and sensor technology needs that are required by those organizations encompass: (1) initial location and characterization of wastes and waste environments - prior to treatment; (2) monitoring of waste retrieval, remediation and

treatment processes; (3) characterization of the co-position of final waste treatment forms to evaluate the performance of waste treatments processes; and (4) site closure and compliance monitoring. Wherever possible, the CMST-IP fosters technology transfer and commercialization of technologies that it sponsors.

2421 (DOE/EM-0163P-Vol.1) Office of Technology Development's Research, Development, Demonstration, Testing and Evaluation Mid-Year Program Review: Volume 1. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. [1994]. 200p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016045. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents brief summaries of waste management, remedial action, decommissioning/decontamination, and waste processing programs and issues currently being developed at Department of Energy Facilities.

2422 (DOE/EM-0163P-Vol.2) Office of Technology Development's Research, Development, Demonstration, Testing and Evaluation Mid-Year Program Review: Volume 2. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. [1994]. 214p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016046. Source: OSTI; NTIS; INIS; GPO Dep.

This document, Volume 2, presents brief summaries of programs being investigated at USDOE sites for waste processing, remedial action, underground storage tank remediation, and robotic applications in waste management.

2423 (DOE/EM-0169P) International Technology Exchange Division: 1993 Annual report. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. 79p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Technology Development (OTD) was established to ensure that reliable and acceptable technologies are available for implementation at DOE sites and that a technically trained work force is available to complete the EM mission by 2019. OTD established the International Technology Exchange Staff (ITES) to identify, evaluate, and acquire international technologies which can accelerate US DOE cleanup operations. ITES's goal is to pursue international collaboration among government organizations, educational institutions, and private industry to identify world-wide needs and available technologies that will meet US environmental needs in general, and EM cleanup needs in particular; and establish mechanisms by which US government ER/WM technologies will be transferred to the US private sector for commercialization and export to international markets. ITES has developed the following strategic objectives to implement its international goals: develop and implement EM's policy for international programs in accordance with DOE and US Government policies and regulations; establish efficient and predictable international technology transfer mechanisms; assist the US private sector in the commercialization and deployment of federally funded EM technologies and related knowledge in international markets; leverage US and non-US resources to accelerate international development and regulatory acceptance of EM technologies; contribute to the improvement of EM's training of US students, scientists, and managers on

international environmental issues. A summary and descriptions of program activities and accomplishments are given for 17 programs which comprise the four main areas of the ITES program: Activities with the Former Soviet Union, International Technology Transfer, International Cooperation, and Information Systems and Publications. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

2424 (DOE/EM-0194) The Western Environmental Technology Office (WETO), Butte, Montana, technology summary. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018931. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared by the DOE Environmental Management (EM) Office of Technology Development (OTD) to highlight its research, development, demonstration, testing, and evaluation activities funded through the Western Environmental Technology Office (WETO) in Butte, Montana. Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US industry's competitiveness in global environmental markets. WETO's environmental technology research and testing activities focus on the recovery of useable resources from waste. Environmental technology development and commercialization activities will focus on mine cleanup, waste treatment, resource recovery, and water resource management. Since the site has no record of radioactive material use and no history of environmental contamination/remediation activities, DOE-EM can concentrate on performing developmental and demonstration activities without the demands of regulatory requirements and schedules. Thus, WETO will serve as a national resource for the development of new and innovative environmental technologies.

2425 (DOE/EM-0199) Plutonium Vulnerability Management Plan. USDOE, Washington, DC (United States). Mar 1995. 153p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009364. Source: OSTI; NTIS; INIS; GPO Dep.

This Plutonium Vulnerability Management Plan describes the Department of Energy's response to the vulnerabilities identified in the Plutonium Working Group Report which are a result of the cessation of nuclear weapons production. The responses contained in this document are only part of an overall, coordinated approach designed to enable the Department to accelerate conversion of all nuclear materials, including plutonium, to forms suitable for safe, interim storage. The overall actions being taken are discussed in detail in the Department's Implementation Plan in response to the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1. This is included as Attachment B.

2426 (DOE/EW/53023-T5-Exec.Summ.) Hazardous materials in aquatic environments of the Mississippi River Basin: Annual technical report, December 30, 1992-December 29, 1993. Tulane Univ., New Orleans, LA (United States). Center for Bioenvironmental Research; Xavier Univ. of Louisiana, New Orleans, LA (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EW53023. Order Number DE94010676. Source: OSTI; NTIS; INIS; GPO Dep.

Tulane and Xavier Universities have singled out the environment as a major strategic focus for research and training

for now and by the year 2000. In December, 1992, the Tulane/Xavier CBR was awarded a five year grant to study pollution in the Mississippi River system. The "Hazardous Materials in Aquatic Environments of the Mississippi River Basin" project is a broad research and education program aimed at elucidating the nature and magnitude of toxic materials that contaminate aquatic environments of the Mississippi River Basin. Studies include defining the complex interactions that occur during the transport of contaminants, the actual and potential impact on ecological systems and health, and the mechanisms through which these impacts might be remediated. The Mississippi River Basin represents a model system for analyzing and solving contamination problems that are found in aquatic systems world-wide. These research and education projects are particularly relevant to the US Department of Energy's programs aimed at addressing aquatic pollution problems associated with DOE National Laboratories. First year funding supported seven collaborative cluster projects and twelve initiation projects. This report summarizes research results for period December 1992–December 1993.

2427 (DOE/HWP-130) Literature search, review, and compilation of data for chemical and radiochemical sensors: Task 1 report. Oak Ridge National Lab., TN (United States). HAZWRAP Support Contractor Office; Advanced Sciences, Inc., Albuquerque, NM (United States). Jan 1993. 208p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009602. Source: OSTI; NTIS; INIS; GPO Dep.

During the next several decades, the US Department of Energy is expected to spend tens of billions of dollars in the characterization, cleanup, and monitoring of DOE's current and former installations that have various degrees of soil and groundwater contamination made up of both hazardous and mixed wastes. Each of these phases will require site surveys to determine type and quantity of hazardous and mixed wastes. It is generally recognized that these required survey and monitoring efforts cannot be performed using traditional chemistry methods based on laboratory evaluation of samples from the field. For that reason, a tremendous push during the past decade or so has been made on research and development of sensors. This report contains the results of an extensive literature search on sensors that are used or have applicability in environmental and waste management. While restricting the search to a relatively small part of the total chemistry spectrum, a sizable body of reference material is included. Results are presented in tabular form for general references obtained from data base searches, as narrative reviews of relevant chapters from proceedings, as book reviews, and as reviews of journal articles with particular relevance to the review. Four broad sensor types are covered: electrochemical processes, piezoelectric devices, fiber optics, and radiochemical processes. The topics of surface chemistry processes and biosensors are not treated separately because they often are an adjunct to one of the four sensors listed. About 1,000 tabular entries are listed, including selected journal articles, reviews of conference/meeting proceedings, and books. Literature to about mid-1992 is covered.

2428 (DOE/ID-10054(93)) Radioactive waste management information for 1993 and record-to-date. Taylor, K.A. Idaho National Engineering Lab., Idaho Falls, ID (United States), Jul 1994. 478p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC07-76ID01570. (INEL/MISC-94052). Order Number DE95002007. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents detailed data, bar graphs, and pie charts on volume, radioactivity, isotopic identity, origin, and decay status of radioactive waste for the calendar year 1993. It also summarizes the radioactive waste data records compiled from 1952 to present for the Idaho National Engineering Laboratory (INEL). The data presented are from the INEL Radioactive Waste Management Information System.

2429 (DOE/ID-10454) FY-94 buried waste integrated demonstration program report. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC-94063). Order Number DE95002024. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) supports the applied research, development, demonstration, and evaluation of a multitude of advanced technologies. These technologies are being integrated to form a comprehensive remediation system for the effective and efficient remediation of buried waste. These efforts are identified and coordinated in support of the U.S. Department of Energy (DOE), Environmental Restoration and Waste Management (ER/WM) needs and objectives. This document summarizes previous demonstrations and describes the FY-94 BWID technology development and demonstration activities. Sponsored by the DOE Office of Technology Development (OTD), BWID works with universities and private industry to develop these technologies, which are being transferred to the private sector for use nationally and internationally. A public participation policy has been established to provide stakeholders with timely and accurate information and meaningful opportunities for involvement in the technology development and demonstration process.

2430 (DOE/MC/29106-95/C0427) Geophysical data fusion for subsurface imaging. Blohm, M.; Hatch, W.E.; Hoekstra, P.; Porter, D.W. Coleman Research Corp., Columbia, MD (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29106. (CONF-9411149-11: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007567. Source: OSTI; NTIS; INIS; GPO Dep.

Effective site characterization requires that many relevant geologic, hydrogeologic and biological properties of the subsurface be evaluated. A parameter that often directly influences chemical processes, ground water flow, contaminant transport, and biological activities is the lateral and vertical distribution of clays. The objective of the research and development under this contract is to improve non-invasive methods for detecting clay lenses. The percentage of clays in soils influences most physical properties that have an impact on environmental restoration and waste management. For example, the percentage of clays determine hydraulic permeability and the rate of contaminant migration, absorption of radioactive elements, and interaction with organic compounds. Therefore, improvements in non-invasive mapping of clays in the subsurface will result in better: characterization of contaminated sites, prediction of pathways of contaminant migration, assessment of risk of contaminants to public health if contaminants reach water supplies, design of remedial action and evaluation of alternative action.

2431 (DOE/MC/30357-95/C0418) Three-dimensional subsurface imaging synthetic aperture radar. Moussally,

G.J. Mirage Systems, Sunnyvale, CA (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30357. (CONF-9411149-5: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007569. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this applied research and development project is to develop a system known as '3-D SISAR'. This system consists of a ground penetrating radar with software algorithms designed for the detection, location, and identification of buried objects in the underground hazardous waste environments found at DOE storage sites. Three-dimensional maps of the object locations will be produced which can assist the development of remediation strategies and the characterization of the digface during remediation operations. It is expected that the 3-D SISAR will also prove useful for monitoring hydrocarbon based contaminant migration after remediation. The underground imaging technique being developed under this contract utilizes a spotlight mode Synthetic Aperture Radar (SAR) approach which, due to its inherent stand-off capability, will permit the rapid survey of a site and achieve a high degree of productivity over large areas. When deployed from an airborne platform, the stand-off techniques is also seen as a way to overcome practical survey limitations encountered at vegetated sites.

2432 (DOE/MC/30358-95/C0432) Geophex airborne unmanned survey system. Won, I.J.; Taylor, D.W.A. Geophex Ltd., Raleigh, NC (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30358. (CONF-9411149-4: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007566. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this effort is to design, construct, and evaluate a portable, remotely-piloted, airborne, geophysical survey system. This nonintrusive system will provide "stand-off" capability to conduct surveys and detect buried objects, structures, and conditions of interest at hazardous locations. This system permits two operators to rapidly conduct geophysical characterization of hazardous environmental sites. During a survey, the operators remain remote from, but within visual distance, of, the site. The sensor system never contacts the Earth, but can be positioned near the ground so that weak anomalies can be detected.

2433 (DOE/METC-94/1002, pp. 228-243) LBL/ Industry Heterogeneous Reservoir Performance Definition Project. Majer, E.L. (Lawrence Berkeley Lab., CA (United States)); Long, J.C.S. USDOE Morgantown Energy Technology Center, WV (United States). Nov 1993. (CONF-9311156-: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). In *Proceedings of the fuels technology contractors review meeting*. 568p. Order Number DE94004065. Source: OSTI; NTIS.

One of the problems facing the petroleum industry is the recovery of oil from heterogeneous, fractured reservoirs and from reservoirs that have been partially depleted. In response to this need, several companies, notably British Petroleum USA, (BP) and Continental Oil Company (Conoco), have established integrated reservoir description programs. Concurrently, LBL is actively involved in developing characterization technology for heterogeneous, fractured rock, mainly for the DOE's Civilian Nuclear Waste Program

and Geothermal Energy programs. The technology developed for these programs was noticed by the petroleum industry and resulted in cooperative research centered on the petroleum companies test facilities. The emphasis of this work is a tightly integrated interdisciplinary approach to the problem of characterizing complex, heterogeneous earth materials. In this approach, the authors explicitly combine the geologic, geomechanical, geophysical and hydrologic information in a unified model for predicting fluid flow. Described here is a comprehensive program between DOE and industry that uses this philosophy through an integrated field testing effort that focuses on realizing techniques for providing an integrated petroleum reservoir description. The work described here is the work being carried out at Conoco's Newkirk test facility. Later phases of the work will involve actual application at a production field.

2434 (DOE/MWIP-27) Preliminary hazards analysis - vitrification process. Coordes, D. (Science Applications International Corp., Pleasanton, CA (United States)); Ruggeri, M.; Russell, J.; TenBrook, W.; Yimbo, P. Lawrence Livermore National Lab., CA (United States); Science Applications International Corp., Pleasanton, CA (United States). Jun 1994. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (UCRL-CR-116576). Order Number DE94016453. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a Preliminary Hazards Analysis (PHA) for mixed waste vitrification by joule heating. The purpose of performing a PHA is to establish an initial hazard categorization for a DOE nuclear facility and to identify those processes and structures which may have an impact on or be important to safety. The PHA is typically performed during and provides input to project conceptual design. The PHA is then followed by a Preliminary Safety Analysis Report (PSAR) performed during Title 1 and 2 design. The PSAR then leads to performance of the Final Safety Analysis Report performed during the facility's construction and testing. It should be completed before routine operation of the facility commences. This PHA addresses the first four chapters of the safety analysis process, in accordance with the requirements of DOE Safety Guidelines in SG 830.110. The hazards associated with vitrification processes are evaluated using standard safety analysis methods which include: identification of credible potential hazardous energy sources; identification of preventative features of the facility or system; identification of mitigative features; and analyses of credible hazards. Maximal facility inventories of radioactive and hazardous materials are postulated to evaluate worst case accident consequences. These inventories were based on DOE-STD-1027-92 guidance and the surrogate waste streams defined by Mayberry, et al. Radiological assessments indicate that a facility, depending on the radioactive material inventory, may be an exempt, Category 3, or Category 2 facility. The calculated impacts would result in no significant impact to offsite personnel or the environment. Hazardous materials assessment indicates that a Mixed Waste Vitrification facility will be a Low Hazard facility having minimal impacts to offsite personnel and the environment.

2435 (DOE/NTP-94-1040) National transuranic program plan. USDOE Carlsbad Area Office, NM (United States). 11 Oct 1994. 36p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005221. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of various program initiatives, the U.S. generated and will continue to generate waste contaminated with

radioactive materials. Because of increased awareness of the risks and special requirements to safely manage long-lived alpha-emitting radionuclides, a new category of radioactive waste, transuranic (TRU) waste, was adopted in 1970. Heads of Field Elements can determine that other alpha-contaminated wastes, peculiar to a specific site, must be managed as transuranic waste". TRU waste is generated and stored at various DOE sites around the country. In December 1993, the National Transuranic Program Office (NTPO) was established as part of the Carlsbad Area Office (CAO) to integrate and coordinate the diverse organizational elements that contribute to the complex-wide management of TRU waste. Numerous sites with small TRU waste inventories are also part of the national TRU waste system. The majority of TRU waste is also contaminated with hazardous materials and is thus considered mixed waste. Mixed waste must be managed in compliance with all federal, state, and local regulations that are applicable to the radioactive and/or hazardous component of the waste. Each generator site is responsible for the management of its respective waste. Sites must plan and implement programs to minimize, characterize, package, treat, store, ship, and dispose of all TRU waste; construct required waste management facilities and equipment; obtain permits; perform site-specific National Environmental Policy Act (NEPA) analyses; conduct environmental studies; perform laboratory analyses; and certify that waste meets appropriate disposal facility criteria. Due to the toxicity and long half-lives of TRU radionuclides, TRU waste must be disposed in a manner that offers greater confinement than shallow land burial.

2436 (DOE/NTP-94-1041) National Transuranic Program Charter. USDOE Carlsbad Area Office, NM (United States). Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005222. Source: OSTI; NTIS; INIS; GPO Dep.

The National Transuranic Program Plan and Charter describes the functional elements of the National TRU Program, organizational relationships, programmatic responsibilities, division of work scope among the various DOE organizations that comprise the program, and program baselines against which overall progress will be measured. The charter defines the authorities and responsibilities of various organizations involved in the management of TRU waste throughout the DOE complex.

2437 (DOE/NV-380) Evaluation of soil radioactivity data from the Nevada Test Site. IT Corp., Las Vegas, NV (United States); Nevada Univ., Las Vegas, NV (United States). Desert Research Inst. Mar 1995. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-92NV10972. Order Number DE95008214. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1951, 933 nuclear tests have been conducted at the Nevada Test Site (NTS) and test areas on the adjacent Tonopah Test Range (TTR) and Nellis Air Force Range (NAFR). Until the early 1960s, the majority of tests were atmospheric, involving detonation of nuclear explosive devices on the ground or on a tower, suspended from a balloon or dropped from an airplane. Since the signing of the Limited Test Ban Treaty in 1963, most tests have been conducted underground, although several shallow subsurface tests took place between 1962 and 1968. As a result of the aboveground and near-surface nuclear explosions, as well as ventings of underground tests, destruction of nuclear devices with conventional explosives, and nuclear-rocket engine tests, the surface soil on portions of the NTS has

been contaminated with radionuclides. Relatively little consideration was given to the environmental effects of nuclear testing during the first two decades of operations at the NTS. Since the early 1970s, however, increasingly strict environmental regulations have forced greater attention to be given to contamination problems at the site and how to remediate them. One key element in the current environmental restoration program at the NTS is determining the amount and extent of radioactivity in the surface soil. The general distribution of soil radioactivity on the NTS is already well known as a result of several programs carried out in the 1970s and 1980s. However, questions have been raised as to whether the data from those earlier studies are suitable for use in the current environmental assessments and risk analyses. The primary purpose of this preliminary data review is to determine to what extent the historical data collected at the NTS can be used in the characterization/remediation process.

2438 (DOE/NV-381) Task summary for cone penetrating testing sounding and soil and groundwater sampling Salmon Site, Lamar County, Mississippi. International Technology, Inc., Las Vegas, NV (United States). Oct 1994. 369p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-92NV10972. Order Number DE95001290. Source: OSTI; NTIS; INIS; GPO Dep.

The Salmon Site (SS), located in Mississippi, was the site of two nuclear and two gas explosion tests conducted deep underground in the Tatum Salt Dome between 1964 and 1970. As a consequence radionuclides generated during the testing were released into the salt dome. During reentry drilling and other site activities, incidental liquid and solid wastes that contained radioactivity were generated, resulting in some soil, ground water and equipment contamination. US DOE is conducting a series of investigations as a part of the Remedial Investigation and Feasibility Study (under CERCLA) This report summarizes the cone penetrometer testing (CPT) and sampling program conducted in fall 1993, providing a description of the activities and a discussion of the results. The objectives of the CPT program were to determine subsurface conditions and stratification; determine the depth to the potentiometric surface; obtain soil samples from predetermined depths; obtain groundwater samples at predetermined depths.

2439 (DOE/OR-01-1194-D2) Site characterization plan for groundwater in Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Lee, R.R.; Curtis, A.H.; Houlberg, L.M.; Purucker, S.T.; Singer, M.L.; Tardiff, M.F.; Wolf, D.A. Oak Ridge National Lab., TN (United States). Jul 1994. 285p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-191-D2). Order Number DE94015940. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Area Grouping (WAG) 1 Groundwater Operable Unit (OU) at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, is undergoing a site characterization to identify environmental contamination that may be present. This document, Site Characterization Report for Groundwater in Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, identifies areas of concern with respect to WAG 1 groundwater and presents the rationale, justification, and objectives for conducting this continuing site characterization. This report summarizes the operations that have taken place at each of the areas of concern in WAG 1, summarizes previous characterization studies that have been performed, presents interpretations

of previously collected data and information, identifies contaminants of concern, and presents an action plan for further site investigations and early actions that will lead to identification of contaminant sources, their major groundwater pathways, and reduced off-site migration of contaminated groundwater to surface water. Site characterization Activities performed to date at WAG 1 have indicated that groundwater contamination, principally radiological contamination, is widespread. An extensive network of underground pipelines and utilities have contributed to the dispersal of contaminants to an unknown extent. The general absence of radiological contamination in surface water at the perimeter of WAG 1 is attributed to the presence of pipelines and underground waste storage tank sumps and dry wells distributed throughout WAG 1 which remove more than about 40 million gal of contaminated groundwater per year.

2440 (DOE/OR-2013) Aqueous nitrate waste treatment: Technology comparison, cost/benefit, and market analysis. Kapline Enterprises, Inc., Knoxville, TN (United States). Jan 1994. 260p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008871. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this analysis is to provide information necessary for the Department of Energy (DOE) to evaluate the practical utility of the Nitrate to Ammonia and Ceramic or Glass (NAC/NAG/NAX) process, which is under development in the Oak Ridge National Laboratory. The NAC/NAG/NAX process can convert aqueous radioactive nitrate-laden waste to a glass, ceramic, or grout solid waste form. The tasks include, but are not limited to, the following: Identify current commercial technologies to meet hazardous and radiological waste disposal requirements. The technologies may be thermal or non-thermal but must be all inclusive (i.e., must convert a radionuclide-containing nitrate waste with a pH around 12 to a stable form that can be disposed at permitted facilities); evaluate and compare DOE-sponsored vitrification, grouting, and minimum additive waste stabilization projects for life-cycle costs; compare the technologies above with respect to material costs, capital equipment costs, operating costs, and operating efficiencies. For the NAC/NAG/NAX process, assume aluminum reactant is government furnished and ammonia gas may be marketed; compare the identified technologies with respect to frequency of use within DOE for environmental management applications with appropriate rationale for use; Assess the potential size of the DOE market for the NAC/NAG/NAX process; assess and off-gas issues; and compare with international technologies, including life-cycle estimates.

2441 (DOE/RL-91-36-Rev.2) Standard Review Plan for Environmental Restoration Program Quality Management Plans: Revision 2. USDOE Richland Operations Office, WA (United States). Dec 1993. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94005524. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy, Richland Operations Office (RL) Manual Environmental Restoration Program Quality System Requirements (QSR) for the Hanford Site, defines all quality requirements governing Hanford Environmental Restoration (ER) Program activities. The QSR requires that ER Program participants develop Quality Management Plans (QMPs) that describe how the QSR requirements will be implemented for their assigned scopes of work. This standard review plan (SRP) describes the ER program participant responsibilities for submittal of QMPs to the RL

Environmental Restoration Division for review and the RL methodology for performing the reviews of participant QMPs. The SRP serves the following functions: acts as a guide in the development or revision of QMPs to assure that the content is complete and adequate; acts as a checklist to be used by the RL staff in their review of participant QMPs; acts as an index or matrix between the requirements of the QSR and implementing methodologies described in the QMPs; decreases the time and subjectivity of document reviews; and provides a formal, documented method for describing exceptions, modifications, or waivers to established ER Program quality requirements.

2442 (DOE/RL-93-77) Environmental restoration and remediation technical data management plan. Key, K.T.; Fox, R.D. USDOE Richland Operations Office, WA (United States). Feb 1994. 99p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017322. Source: OSTI; NTIS; INIS; GPO Dep.

The tasks performed in the Remedial Investigation/Feasibility Study (RI/FS) work plan for each Hanford Site operable unit must meet the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement, Ecology et. al 1992). An extensive amount of data will be generated in the evaluation and remediation of hazardous waste sites at the Site. The data must be of sufficient quality, as they will be used to evaluate the need, select the method(s), and support the full remediation of the waste sites as stipulated in the Tri-Party Agreement. In particular, a data management plan (DMP) is to be included in an RI/FS work plan for managing the technical data obtained during the characterization of an operable unit, as well as other data related to the study of the operable unit. Resource Conservation and Recovery Act of 1976 (RCRA) sites are involved in the operable unit. Thus, the data management activities for the operable unit should be applied consistently to RCRA sites in the operable unit as well. This DMP provides common direction for managing the environmental technical data of all defined operable units at the Hanford Site during the RI/FS activities. Details specific to an operable unit will be included in the actual work plan of that operable unit.

2443 (DOE/RL-93-79) Limited field investigation report for the 100-KR-4 Operable Unit. USDOE Richland Operations Office, WA (United States). Jul 1994. 94p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94015648. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) was conducted to optimize the use of interim remedial measures (IRM) for expediting clean up while maintaining a technically sound and cost-effective program. The 100-KR-4 Operable Unit is one of four operable units associated with the 100 K Area. Operable units KR-1, KR-2 and KR-3 address contaminant sources while 100-KR-4 addresses contamination present in the underlying groundwater. The IRM decision process for groundwater operable units is based on three aspects: (1) Is the concentration greater than Hanford background? (2) Does the concentration present a medium or high human-health risk? (3) Does the concentration exceed an ecologically based applicable, relevant and appropriate requirements (ARAR) or present an environmental hazard quotient > 1? The primary methods of investigation used during this LFI were the installation of monitoring wells and sampling of groundwater. The samples collected from the

groundwater and soils were submitted for laboratory analysis. Boreholes were surveyed for radiological contamination using downhole geophysical techniques to further delineate the location and degree of contamination. All soil samples were screened to ascertain the presence of volatile organic compounds and radionuclides. Analytical data were subjected to validation; all first round and a minimum of 10% of subsequent round data were validated.

2444 (DOE/RL-93-99) Remedial Investigation and feasibility study report for the Environmental Restoration Disposal Facility. Roock, F.V. USDOE Richland Operations Office, WA (United States). Jun 1994. 630p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94015713. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the remedial investigation (RI) is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives. To characterize the site, the lead agency shall, as appropriate, conduct field investigations, including treatability studies, and conduct a baseline risk assessment. The RI provides information to assess the risks to human health and the environment and to support the development, evaluation, and selection of appropriate response alternatives. The primary objective of the feasibility study (FS) is to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected. The lead agency may develop a feasibility study to address a specific site problem or the entire site. The development and evaluation of alternatives shall reflect the scope and complexity of the remedial action under consideration and the site problems being addressed. Development of alternatives shall be fully integrated with the site characterization activities of the remedial investigation described in paragraph (d) of this section. The lead agency shall include an alternatives screening step, when needed, to select a reasonable number of alternatives for detailed analysis.

2445 (DOE/RL-94-14) Radioactive air emissions notice of construction for the 105N Basin Stabilization. Coenenberg, E.T. (Westinghouse Hanford Co., Richland, WA (United States)). USDOE Richland Operations Office, WA (United States). [1994]. 118p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94010336. Source: OSTI; NTIS; INIS; GPO Dep.

The 105N Basin (basin) Stabilization will place the basin in a radiologically and environmentally safe condition so that it can be decommissioned at a later date. The basin is in the 105N Building, which is located in the 100N Area. The 100N Area is located in the Northern portion of the Hanford Site approximately 35 miles northwest of the city of Richland, Washington. The basin stabilization objectives are to inspect for Special Nuclear Material (SNM) (i.e., fuel assemblies and fuel pieces), remove the water from the basin and associated pits, and stabilize the basin surface. The stabilization will involve removal of basin hardware, removal of basin sediments, draining of basin water, and cleaning and stabilizing basin surfaces to prevent resuspension of radioactive emissions to the air. These activities will be conducted in accordance with all applicable regulations.

2446 (DOE/RL-94-74) Implementation guide for Hanford Analytical Services Quality Assurance Plan. USDOE Richland Field Office, WA (United States). Sep

1994. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94019041. Source: OSTI; NTIS; INIS; GPO Dep.

This implementation guide for the Hanford Analytical Services Quality Assurance Plan (HASQAP) was developed by the US Department of Energy, Richland Operations Office (RL) Waste Management Division, Analytical Services Branch. This plan formally presents RL's direction for Hanford Sitewide implementation of the HASQAP. The HASQAP establishes a uniform standard for quality requirements to meet US Department of Energy Order 5700.6C, Quality Assurance (10 CFR 830.120, "Quality Assurance Requirements"), and is intended to satisfy the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) requirements for "Guidance on Preparation of Laboratory Quality Assurance Plans". The quality assurance criteria specified in the HASQAP shall serve as a baseline for implementing quality management systems for the laboratories that provide analytical services, for data requesters and users, and for oversight organizations that monitor the data-generation process. Affected organizations shall implement the HASQAP requirements that are applicable to their work scope. Full implementation of the HASQAP is scheduled to occur by August 1995. RL will work with the US Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) to have the HASQAP document incorporated into Appendix F of the Tri-Party Agreement by early Fiscal Year 1996.

2447 (DOE/RL-94-106) Needs assessment activity report. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Transportation Management Div. Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004145. Source: OSTI; NTIS; INIS; GPO Dep.

As part of a Transportation Management Division task (TMD), the Packaging Programs and Testing Group within Westinghouse Hanford Company (WHC) has assessed the packaging needs of some of the mid- and small-sized US Department of Energy (DOE) sites by visiting them and meeting with their transportation and packaging personnel. To date, ten DOE facilities have been visited. As a result, these sites have been informed of some of the packaging activities that TMD has sponsored and is sponsoring, have been apprised of possible upcoming changes to transportation regulations, have discussed their short-term packaging needs, and have shared unique packaging they have developed which may be of use to other DOE facilities.. This report summarizes the findings from visits to the following sites: Fermi National Laboratory; Argonne National Laboratory; New Brunswick Laboratory; EG and G Mound Applied Technologies; Fernald Environmental Management Project; West Valley Demonstration Project; Lawrence Berkeley Laboratory; Stanford Linear Accelerator Center; Brookhaven National Laboratory; and Princeton Plasma Physics Laboratory.

2448 (DOE/RL-94-106-Rev.1) Needs assessment activity report. Revision 1. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007190. Source: OSTI; NTIS; INIS; GPO Dep.

TTP/RL439005.

As part of a Transportation Management Division task (TMD), the Packaging Programs and Testing Group within Westinghouse Hanford Company (WHC) has assessed the

packaging needs of some of the mid- and small-sized US Department of Energy (DOE) sites by visiting them and meeting with their transportation and packaging personnel. To date, ten DOE facilities have been visited. As a result, these sites have been informed of some of the packaging activities that TMD has sponsored and is sponsoring, have been apprised of possible upcoming changes to transportation regulations, have discussed their short-term packaging needs, and have shared unique packaging they have developed which may be of use to other DOE facilities. Program successes include developing a questionnaire that discusses the potential impact of US Department of Transportation (DOT) Docket HM-169A, Transportation Regulations; Compatibility with Regulations of the International Atomic Energy Agency; Notice of Proposed Rule (DOT 1989), discovery of a need for a reusable Type A liquid sample packaging and starting its development within another TMD task, coordinating resources between Fermi Laboratory and Argonne National Laboratory, and widening the distribution of WHC-EP-0558, Test and Evaluation Document for DOT Specification 7A Type A Packaging (WHC 1994).

2449 (DOE/RL/11946-T2-Vol.1) Waste receiving and processing facility module 1, detailed design report. Raytheon Engineers and Constructors, Inc., Philadelphia, PA (United States). Oct 1993. 222p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-91RL11946. Order Number DE94019135. Source: OSTI; NTIS; INIS; GPO Dep.

WRAP 1 baseline documents which guided the technical development of the Title design included: (a) A/E Statement of Work (SOW) Revision 4C: This DOE-RL contractual document specified the workscope, deliverables, schedule, method of performance and reference criteria for the Title design preparation. (b) Functional Design Criteria (FDC) Revision 1: This DOE-RL technical criteria document specified the overall operational criteria for the facility. The document was a Revision 0 at the beginning of the design and advanced to Revision 1 during the tenure of the Title design. (c) Supplemental Design Requirements Document (SDRD) Revision 3: This baseline criteria document prepared by WHC for DOE-RL augments the FDC by providing further definition of the process, operational safety, and facility requirements to the A/E for guidance in preparing the design. The document was at a very preliminary stage at the onset of Title design and was revised in concert with the results of the engineering studies that were performed to resolve the numerous technical issues that the project faced when Title I was initiated, as well as, by requirements established during the course of the Title II design.

2450 (DOE/RL/11946-T2-Vol.2) Waste receiving and processing facility module 1, detailed design report. Raytheon Engineers and Constructors, Inc., Philadelphia, PA (United States). Oct 1993. 1145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-91RL11946. Order Number DE94019136. Source: OSTI; NTIS; INIS; GPO Dep.

DOE Order 5480.1B states that it is Departmental Policy to assure compliance with applicable statutory requirements affecting Federal facilities and operations. DOE Order 5481.1B Chg.1 requires, as part of the facility safety analysis the identification and demonstration of conformance with applicable guides, codes and standards, and further mandates, all deviations from current DOE design criteria shall be evaluated and documented in the facility safety analysis report (SAR). DOE Order 6430.1A "General Design Criteria"

provides mandatory, minimally acceptable criteria for facility design. These criteria are not intended to impose unnecessary design restrictions in requirements or to discourage design innovation. Deviations may be granted by DOE organizations responsible for facility projects or granted by the DOE programmatic office responsible for the design of facilities when any of the following apply: A specific portion of the general design criteria is determined to be inadequate or inappropriate for the facility under design. Minor deviations are necessary or advantageous in the judgement of design professional. A criterion does not reflect currently applicable codes, standards, regulations, or architectural or engineering principles and practices. A criterion affecting environmental protection or safety is less stringent than local or State codes or regulations. Deviations will achieve economies in facility construction, operation or maintenance without significant adverse effects on programmatic or operating needs or DOE design policy and objectives. Deviations will not affect DOE design policy and objectives and are determined to be necessary in the acquisition of building by lease or purchase. Deviations will not affect DOE design policy and objectives, are necessary, and are allowable existing exemption or variance provisions of another DOE directive.

2451 (DOE/WIPP-91-005-Rev.4) Waste Isolation Pilot Plant RCRA Part A permit application. Revision 4. USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. [1995]. 376p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008674. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Plant (WIPP) is a US Department of Energy facility intended to demonstrate the technical and operational principles involved in the permanent isolation and disposal of defense-generated transuranic waste. WIPP operations entail receiving, unloading, and transferring radioactive-mixed waste from the surface of the site to the underground hazardous waste management units. Waste will be emplaced in an underground geologic repository horizon located in a deep-bedded salt formation. This report contains Part A of the Resource Conservation and Recovery Act hazardous waste permit application.

2452 (DOE/WIPP-94-006) Geotechnical analysis report, July 1992-June 1993. Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1993]. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94014254. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides an assessment of the geotechnical status of the Waste Isolation Pilot Plant (WIPP). During the construction of the principal underground access and experimental areas, reporting was on a quarterly basis. Since 1987, reporting has been carried out annually because additional excavations will take place gradually over an extended period. This report presents and analyzes data collected up to June 30, 1993. The format of the Geotechnical Analysis Report was selected to meet the needs of several audiences. This report focuses on the geotechnical performance of the various underground facilities including the shafts, shaft stations, access drifts, test rooms, and waste storage areas. The results of excavation effects investigations, stratigraphic mapping, and other geologic studies are also included. The report provides an evaluation of the geotechnical aspects of performance in the context of the relevant design criteria and also describes the techniques used to acquire the data and the performance history

of the instruments. The depth and breadth of the evaluation for the different underground facilities varies according to the types and quantities of data that are available, and the complexity of the recorded geotechnical responses.

2453 (DOE/WIPP-94-2018) **Environmental Protection Implementation plan for the Waste Isolation Pilot Plant, November 9, 1994, to November 9, 1995.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1994]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95002831. Source: OSTI; NTIS; INIS; GPO Dep.

This Environmental Protection Implementation Plan (EPIP) has been prepared to meet federal, state, and local requirements by delineating how the Carlsbad Area office (CAO) and the Waste Isolation Pilot Plant (WIPP) Site Branch (WSB) intends to implement the provisions of DOE Order 5400.1. Its purpose is to list environmental protection goals and objectives for the WIPP; identify strategies, manpower allocations, and timetables for attaining these goals and objectives; describe the WIPP organizational structure; discuss the development of procedures; and assign responsibilities for compliance with federal, state, and local environmental laws and regulations. This EPIP covers the periods from November 9, 1994 through November 9, 1995.

2454 (DOE/WIPP-94-2027) **1994 Panel 1 Utilization Plan.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1994]. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95002833. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is intended to receive, handle, and permanently dispose of transuranic (TRU) waste. To fulfill this mission, the U.S. Department of Energy (DOE) constructed a full-scale facility to demonstrate both technical and operational principles of the permanent isolation of TRU waste. The WIPP consists of surface and underground facilities. Panel 1 is situated in the underground facility horizon which is located approximately 2,150 feet below the surface in the predominantly halite Salado Formation. The Panel 1 Utilization Plan provides a strategy for the optimum use of Panel 1 which is consistent with the priorities established by the DOE to accomplish the WIPP mission. These priorities, which include maintaining personnel safety, conducting performance assessment, and continued operational enhancements, are the guiding premise for the decisions on the planned usage of the WIPP underground facility. The continuation of ongoing investigations along with the planned testing and training to be carried out in Panel 1 will enhance the current knowledge and understanding of the operational and geotechnical aspects of the panel configuration. This enhancement will ultimately lead to safer, more efficient, and more cost-effective methods of operation. Excavation of the waste storage area began in May 1986 with the mining of entries to Panel 1. The original design for the waste storage rooms at the WIPP provided a limited period of time during which to mine the openings and to emplace waste. Each panel, consisting of seven storage rooms, was scheduled to be mined and filled in less than 5 years. Panel 1 was developed to receive waste for a demonstration phase that was scheduled to start in October 1988. The demonstration phase was deferred, and the experimental test program was modified to use contact-handled (CH) transuranic waste in bin-scale tests, planned for Room 1, Panel 1.

2455 (EGG-11265-1050) **An aerial radiological survey of the Oyster Creek Nuclear Power Plant and surrounding area, Forked River, New Jersey: Date of survey: September 18-25, 1992.** Hopkins, H.A.; McCall, K.A. EG and G Energy Measurements, Inc., Las Vegas, NV (United States). Remote Sensing Lab. May 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. Order Number DE94016801. Source: OSTI; NTIS; INIS; GPO Dep.

An aerial radiological survey was conducted over the Oyster Creek Nuclear Power Plant in Forked River, New Jersey, during the period September 18 through September 24, 1992. The survey was conducted at an altitude of 150 feet (46 meters) over a 26-square-mile (67-square-kilometer) area centered on the power station. The purpose of the survey was to document the terrestrial gamma radiation environment of the Oyster Creek Nuclear Power plant and surrounding area. The results of the aerial survey are reported as inferred gamma radiation exposure rates at 1 meter above ground level in the form of a contour map. Outside the plant boundary, exposure rates were found to vary between 4 and 10 microroentgens per hour and were attributed to naturally-occurring uranium, thorium, and radioactive potassium gamma emitters. The aerial data were compared to ground-based benchmark exposure rate measurements and radionuclide assays of soil samples obtained within the survey boundary. The ground-based measurements were found to be in good agreement with those inferred from the aerial measuring system. A previous survey of the power plant was conducted in August 1969 during its initial startup phase. Exposure rates and radioactive isotopes revealed in both surveys were consistent and within normal terrestrial background levels.

2456 (EGG-11265-3004) **Site characterization at the Rabbit Valley Geophysical Performance Evaluation Range.** Koppenjan, S.; Martinez, M. EG and G Energy Measurements, Inc., Santa Barbara, CA (United States). Special Technologies Lab. [1994]. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. (CONF-940353-6: Symposium on the application of geophysics to environmental and engineering problems, Boston, MA (United States), 27-31 Mar 1994). Order Number DE94013550. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (US DOE) is developing a Geophysical Performance Evaluation Range (GPER) at Rabbit Valley located 30 miles west of Grand Junction, Colorado. The purpose of the range is to provide a test area for geophysical instruments and survey procedures. Assessment of equipment accuracy and resolution is accomplished through the use of static and dynamic physical models. These models include targets with fixed configurations and targets that can be re-configured to simulate specific specifications. Initial testing (1991) combined with the current tests at the Rabbit Valley GPER will establish baseline data and will provide performance criteria for the development of geophysical technologies and techniques. The US DOE's Special Technologies Laboratory (STL) staff has conducted a Ground Penetrating Radar (GPR) survey of the site with its stepped FM-CW GPR. Additionally, STL contracted several other geophysical tests. These include an airborne GPR survey incorporating a "chirped" FM-CW GPR system and a magnetic survey with a surfaced-towed magnetometer array unit. Ground-based and aerial video and still frame pictures were also acquired. STL compiled and analyzed all of the geophysical maps and

created a site characterization database. This paper discusses the results of the multi-sensor geophysical studies performed at Rabbit Valley and the future plans for the site.

2457 (EGG-M-94222) Corrosion of spent Advanced Test Reactor fuel. Lundberg, L.B.; Croson, M.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-941207-9: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95002010. Source: OSTI; NTIS; INIS; GPO Dep.

The results of a study of the condition of spent nuclear fuel elements from the Advanced Test Reactor (ATR) currently being stored underwater at the Idaho National Engineering Laboratory (INEL) are presented. This study was motivated by a need to estimate the corrosion behavior of dried, spent ATR fuel elements during dry storage for periods up to 50 years. The study indicated that the condition of spent ATR fuel elements currently stored underwater at the INEL is not very well known. Based on the limited data and observed corrosion behavior in the reactor and in underwater storage, it was concluded that many of the fuel elements currently stored under water in the facility called ICPP-603 FSF are in a degraded condition, and it is probable that many have breached cladding. The anticipated dehydration behavior of corroded spent ATR fuel elements was also studied, and a list of issues to be addressed by fuel element characterization before and after forced drying of the fuel elements and during dry storage is presented.

2458 (EGG-M-94237) A comparison of real-time radiography results and visual characterization results with emphasis on WIPP WAC and TRAMPAC compliance issues. Hailey, S.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940216-6: Nondestructive assay and nondestructive examination waste characterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE95001902. Source: OSTI; NTIS; INIS; GPO Dep.

Visual characterization provides a means of confirming the real-time radiography (RTR) certification process and process knowledge. RTR and visual characterization have been conducted on thirty-three drums containing transuranic (TRU) waste in support of the Waste Isolation Pilot Plant (WIPP) Experimental Test Program (WETP) at the Idaho National Engineering Laboratory. Argonne National Laboratory - West (ANL-W) detected a small can of liquid in one of these drums during the visual examination, resulting in a WIPP Waste Acceptance Criteria (WIPP-WAC) miscertification. The remaining thirty-two drums were certified correctly by the RTR system at the Stored Waste Examination Pilot Plant (SWEPP) for WIPP-WAC and TRUPACT-II Authorized Methods for Payload Control (TRAMPAC) requirements. TRAMPAC contains restrictions on the weights of specific materials allowed in the waste, based on the shipping category. Items on the restricted list for a given shipping category are allowed in quantities less than 1 percent of the weight of the waste. RTR can estimate the weights of certain broad categories in homogeneous waste forms, however, the capability to estimate weights at the 1 percent level is not presently realistic. Process knowledge forms the basis of conformance to these weight requirements. Visual characterization suggests process knowledge is not completely adequate at this level.

2459 (EGG-NRE-10754) Criticality safety evaluation for TRU waste in storage at the RWMC. Shaw, M.E.; Briggs, J.B.; Atkinson, C.A.; Briscoe, G.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1993. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002277. Source: OSTI; NTIS; INIS; GPO Dep.

Stored containers (drums, boxes, and bins) of transuranic waste at the Radioactive Waste Management Complex (RWMC) facility located at the Idaho National Engineering Laboratory (INEL) were evaluated based on inherent neutron absorption characteristics of the waste materials. It was demonstrated that these properties are sufficient to preclude an accidental criticality accident at the actual fissile levels present in the waste stored at the RWMC. Based on the database information available, the results reported herein confirm that the waste drums, boxes, and bins currently stored at the RWMC will remain safely subcritical if rearranged, restacked, or otherwise handled. Acceptance criteria for receiving future drum shipments were established based on fully infinite systems.

2460 (EGG-NRE-11236) Application of PINS and GNAT to the assay of 55-gal containers of radioactive waste. Gehrke, R.J.; Aryaeinejad, R.; Watts, K.D.; Staples, D.R.; Akers, D.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015319. Source: OSTI; NTIS; INIS; GPO Dep.

The Portable Isotopic Neutron Spectroscopy (PINS) and Gamma Neutron Assay Technique (GNAT) assay systems that were developed with funding from the office of Research and Development (NN20), were taken to the Stored Waste Examination Pilot Plant (SWEPP) facility at the Radioactive Waste Management Complex (RWMC) and applied to the assay of surrogate and Rocky Flats Plant waste contained in 55-gal drums. PINS, a portable prompt γ neutron activation analysis technique, was able to identify key elements in both the surrogate and real waste so that three-main waste categories: metal, combustible material, and cemented chlorinated sludge wastes could be identified. GNAT, a γ neutron assay technique for the identification and quantification of fissioning isotopes, was able to identify ^{240}Pu in surrogate waste in which nine 1-g nuclear accident dosimeters were inserted. GNAT was also able to identify ^{240}Pu in real 55-gal waste drums containing 15- and 40-g of plutonium even in the presence of high activity concentrations of ^{241}Am .

2461 (EGG-RWMC-11190) Radiological, physical, and chemical characterization of transuranic wastes stored at the Idaho National Engineering Laboratory. Apel, M.L.; Becker, G.K.; Ragan, Z.K.; Frasure, J.; Raivo, B.D.; Gale, L.G.; Pace, D.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 960p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015385. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides radiological, physical and chemical characterization data for transuranic radioactive wastes and transuranic radioactive and hazardous (i.e., mixed) wastes stored at the Idaho National Engineering Laboratory and considered for treatment under the Private Sector Participation Initiative Program (PSPI). Waste characterization data are provided in the form of INEL Waste Profile Sheets.

These documents provide, for each content code, information on waste identification, waste description, waste storage configuration, physical/chemical waste composition, radionuclide and associated alpha activity waste characterization data, and hazardous constituents present in the waste. Information is provided for 139 waste streams which represent an estimated total volume of 39,380³ corresponding to a total mass of approximately 19,000,000 kg. In addition, considerable information concerning alpha, beta, gamma, and neutron source term data specific to Rocky Flats Plant generated waste forms stored at the INEL are provided to assist in facility design specification.

2462 (EGG-WM-11053) Project Management Plan for the Idaho National Engineering Laboratory Waste Isolation Pilot Plant Experimental Test Program. Connolly, M.J.; Sayer, D.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015383. Source: OSTI; NTIS; INIS; GPO Dep.

EG&G Idaho, Inc. and Argonne National Laboratory-West (ANL-W) are participating in the Idaho National Engineering Laboratory's (INEL's) Waste Isolation Pilot Plant (WIPP) Experimental Test Program (WETP). The purpose of the INEL WET is to provide chemical, physical, and radiochemical data on transuranic (TRU) waste to be stored at WIPP. The waste characterization data collected will be used to support the WIPP Performance Assessment (PA), development of the disposal No-Migration Variance Petition (NMVP), and to support the WIPP disposal decision. The PA is an analysis required by the Code of Federal Regulations (CFR), Title 40, Part 191 (40 CFR 191), which identifies the processes and events that may affect the disposal system (WIPP) and examines the effects of those processes and events on the performance of WIPP. A NMVP is required for the WIPP by 40 CFR 268 in order to dispose of land disposal restriction (LDR) mixed TRU waste in WIPP. It is anticipated that the detailed Resource Conservation and Recovery Act (RCRA) waste characterization data of all INEL retrievably-stored TRU waste to be stored in WIPP will be required for the NMVP. Waste characterization requirements for PA and RCRA may not necessarily be identical. Waste characterization requirements for the PA will be defined by Sandia National Laboratories. The requirements for RCRA are defined in 40 CFR 268, WIPP RCRA Part B Application Waste Analysis Plan (WAP), and WIPP Waste Characterization Program Plan (WWCP). This Project Management Plan (PMP) addresses only the characterization of the contact handled (CH) TRU waste at the INEL. This document will address all work in which EG&G Idaho is responsible concerning the INEL WETP. Even though EG&G Idaho has no responsibility for the work that ANL-W is performing, EG&G Idaho will keep a current status and provide a project coordination effort with ANL-W to ensure that the INEL, as a whole, is effectively and efficiently completing the requirements for WETP.

2463 (EGG-WM-11454) Transport characteristics across drum filter vents and polymer bags. Liekhus, K.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001951. Source: OSTI; NTIS; INIS; GPO Dep.

The rate at which hydrogen (H₂) or a volatile organic compound (VOC) exits a layer of confinement in a vented waste drum is proportional to the concentration difference

across the layer. The proportionality constant is the gas transport characteristic. A series of transport experiments were conducted to determine H₂ and VOC transport characteristics across different drum filter vents and polymer bags. This report reviews the methods and results of past investigators in defining transport characteristics across filter vents and polymer bags, describes the apparatus and procedures used in these experiments, compares the reported and estimated transport characteristics with earlier results, and discusses the impact of changing the transport characteristic values used in model calculations.

2464 (EGG-WM-11479) Characterization of void volume VOC concentration in vented TRU waste drums - an interim report. Liekhus, K.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001921. Source: OSTI; NTIS; INIS; GPO Dep.

A test program is underway at the Idaho National Engineering Laboratory to determine if the concentration of volatile organic compounds (VOCs) in the drum headspace is representative of the VOC concentration in the entire drum void space and to demonstrate that the VOC concentration in the void space of each layer of confinement can be estimated using a model incorporating diffusion and permeation transport principles and limited waste drum sampling data. An experimental test plan was developed requiring gas sampling of 66 transuranic (TRU) waste drums. This interim report summarizes the experimental measurements and model predictions of VOC concentration in the innermost layer of confinement from waste drums sampled and analyzed in FY 1994.

2465 (EGG-WTD-10266-Rev.1) Buried Waste Integrated Demonstration Technology Preparedness and Status Report Guidance. Blacker, P.B.; Bonnenberg, R.W.; Cannon, P.G.; Hyde, R.A.; Watson, L.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015269. Source: OSTI; NTIS; INIS; GPO Dep.

A Technology Preparedness and Status Report is required for each Technical Task Plan funded by the Buried Waste Integrated Demonstration. This document provides guidance for the preparation of that report. Major sections of the report will include a subset of the need for the technology, objectives of the demonstration, technology description and readiness evaluation, demonstration requirements, and preparedness checklist and action plan.

2466 (EGG-WTD-10651) INEL Operable Unit 7-13 containment and stabilization configuration option. Raivo, B.D.; Richardson, J.G.; Nickelson, D.F. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001926. Source: OSTI; NTIS; INIS; GPO Dep.

A containment and stabilization configuration option has been developed for the Idaho National Engineering Laboratory's Subsurface Disposal Area Operable Unit 7-13, the transuranic (TRU)-contaminated waste pits and trenches. The configuration option is presented as an end-to-end system block diagram. Functional subelements are separately discussed, and technical background information, assumptions, input, high-level subelement requirements, and output are presented for each option.

2467 (EGG-WTD-10973) Evaluation of the Contamination Control Unit during simulated transuranic waste retrieval. Thompson, D.N.; Freeman, A.L.; Wixom, V.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1993. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94010711. Source: OSTI; NTIS; GPO Dep.

This report presents the results of a field demonstration at the INEL of the Contamination Control Unit (CCU). The CCU is a field deployable self-contained trailer mounted system to control contamination spread at the site of transuranic (TRU) handling operations. This is accomplished primarily by controlling dust spread. This demonstration was sponsored by the US Department of Energy's Office of Waste Technology Development Buried Waste Integrated Demonstration. The CCU, housed in a mobile trailer for easy transport, supports four different contamination control systems: water misting, dust suppression application, soil fixative application, and vacuuming operations. Assessment of the CCU involved laboratory operational performance testing, operational testing and contamination control at a decommissioned Idaho National Engineering Laboratory reactor, and field testing in conjunction with a simulated TRU buried waste retrieval effort at the Cold Test Pit.

2468 (EGG-WTD-11136) Buried waste integrated demonstration Fiscal Year 1993 close-out report. Owens, K.J.; Hyde, R.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). Apr 1994. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001916. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) supports the applied research, development, demonstration, and evaluation of a multitude of advanced technologies. These technologies are being integrated to form a comprehensive remediation system for the effective and efficient remediation of buried waste. These efforts are identified and coordinated in support of the U.S. Department of Energy Environmental Restoration and Waste Management needs and objectives. BWID works with universities and private industry to develop these technologies, which are being transferred to the private sector for use nationally and internationally. A public participation policy has been established to provide stakeholders with timely and accurate information and meaningful opportunities for involvement in the technology development and demonstration process. To accomplish this mission of identifying technological solutions for remediation deficiencies, the Office of Technology Development initiated BWID at the Idaho National Engineering Laboratory. This report summarizes the activities of the BWID program during FY-93.

2469 (EGG-WTD-11161) La-oxides as tracers for PuO₂ to simulate contaminated aerosol behavior. Meyer, L.C.; Newton, G.J.; Cronenberg, A.W.; Loomis, G.G. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94015265. Source: OSTI; NTIS; INIS; GPO Dep.

An analytical and experimental study was performed on the use of lanthanide oxides (La-oxides) as surrogates for plutonium oxides (PuO₂) during simulated buried waste retrieval. This study determined how well the La-oxides move compared to PuO₂ in aerosolized soils during retrieval scenarios. As part of the analytical study, physical properties of La-oxides and PuO₂, such as molecular diameter, diffusivity,

density, and molecular weight are compared. In addition, an experimental study was performed in which Idaho National Engineering Laboratory (INEL) soil, INEL soil with lanthanides, and INEL soil with plutonium were aerosolized and collected in filters. Comparison of particle size distribution parameters from this experimental study show similarity between INEL soil, INEL soil with lanthanides, and INEL soil with plutonium.

2470 (EGG-WTD-11216) Environment, Safety, Health, and Quality Plan for the Buried Waste Integrated Demonstration Program. Walker, S. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002034. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) is a program funded by the US Department of Energy Office of Technology Development. BWID supports the applied research, development, demonstration, testing, and evaluation of a suite of advanced technologies that together form a comprehensive remediation system for the effective and efficient remediation of buried waste. This document describes the Environment, Safety, Health, and Quality requirements for conducting BWID activities at the Idaho National Engineering Laboratory. Topics discussed in this report, as they apply to BWID operations, include Federal, State of Idaho, and Environmental Protection Agency regulations, Health and Safety Plans, Quality Program Plans, Data Quality Objectives, and training and job hazard analysis. Finally, a discussion is given on CERCLA criteria and System and Performance audits as they apply to the BWID Program.

2471 (ES/ER/TM-102/R1) Waste generation forecast for DOE-ORO's Environmental Restoration OR-1 Project: FY 1995-FY 2002, September 1994 revision. Oak Ridge National Lab., TN (United States). Dec 1994. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004874. Source: OSTI; NTIS; INIS; GPO Dep.

A comprehensive waste-forecasting task was initiated in FY 1991 to provide a consistent, documented estimate of the volumes of waste expected to be generated as a result of U.S. Department of Energy-Oak Ridge Operations (DOE-ORO) Environmental Restoration (ER) OR-1 Project activities. Continual changes in the scope and schedules for remedial action (RA) and decontamination and decommissioning (D&D) activities have required that an integrated data base system be developed that can be easily revised to keep pace with changes and provide appropriate tabular and graphical output. The output can then be analyzed and used to drive planning assumptions for treatment, storage, and disposal (TSD) facilities. The results of this forecasting effort and a description of the data base developed to support it are provided herein. The initial waste-generation forecast results were compiled in November 1991. Since the initial forecast report, the forecast data have been revised annually. This report reflects revisions as of September 1994.

2472 (ES/ER/TM-123) Airborne geophysical survey of the Oak Ridge Reservation, Tennessee. Doll, W.E.; Nyquist, J.E.; Beard, L.P. Oak Ridge National Lab., TN (United States); Paducah Gaseous Diffusion Plant, KY (United States). Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. Order Number DE95004744. Source: OSTI; NTIS; INIS; GPO Dep.

High-resolution and reconnaissance data, acquired using sensors mounted on a helicopter, were used to characterize waste sites and detect geologic properties that influence contaminant transport on the Oak Ridge Reservation (ORR), Tennessee, between December 1992 and April 1994. To date, these data have been used to support several ORR Environmental Restoration (ER) programs. This report summarizes the techniques used, the ways in which the data have been applied to date, and current plans for enhancing the data and making them more useful to the ER programs.

2473 (ES/ER/TM-146) Geostatistical applications in environmental remediation. Stewart, R.N. (Univ. of Tennessee, Knoxville, TN (United States)); Purucker, S.T.; Lyon, B.F. Oak Ridge National Lab., TN (United States). Feb 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009998. Source: OSTI; NTIS; GPO Dep.

Geostatistical analysis refers to a collection of statistical methods for addressing data that vary in space. By incorporating spatial information into the analysis, geostatistics has advantages over traditional statistical analysis for problems with a spatial context. Geostatistics has a history of success in earth science applications, and its popularity is increasing in other areas, including environmental remediation. Due to recent advances in computer technology, geostatistical algorithms can be executed at a speed comparable to many standard statistical software packages. When used responsibly, geostatistics is a systematic and defensible tool can be used in various decision frameworks, such as the Data Quality Objectives (DQO) process. At every point in the site, geostatistics can estimate both the concentration level and the probability or risk of exceeding a given value. Using these probability maps can assist in identifying clean-up zones. Given any decision threshold and an acceptable level of risk, the probability maps identify those areas that are estimated to be above or below the acceptable risk. Those areas that are above the threshold are of the most concern with regard to remediation. In addition to estimating clean-up zones, geostatistics can assist in designing cost-effective secondary sampling schemes. Those areas of the probability map with high levels of estimated uncertainty are areas where more secondary sampling should occur. In addition, geostatistics has the ability to incorporate soft data directly into the analysis. These data include historical records, a highly correlated secondary contaminant, or expert judgment. The role of geostatistics in environmental remediation is a tool that in conjunction with other methods can provide a common forum for building consensus.

2474 (ESTSC-000766AL00000) TEAM. Technology Evaluation and Analysis Methodology Systems Analysis. Bingham, T.A. (Lockheed Idaho Technologies Company, Idaho Falls, ID (United States)); Caldwell, M.A.; Nichols, T.T.; Pincock, L.F.; Reiser, S.I. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1 Oct 1994. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Source: ESTSC.

Description: APPLE MACINTOSH; Apple System 7 or higher; Prograph CPX; 1 3.5 Diskette.

TEAM provides a computer simulation/systems model for evaluation of process technology options to process nuclear waste at the Idaho Chemical Processing Plant. The model uses a life-cycle approach to evaluate costs for user specified options, as well as time phasing effects to cost, waste volumes, time to completion of processing, and other variables.

2475 (FEMP-2303) Uranium soils integrated demonstration, 1993 status. Nuhfer, K. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-940225-118; Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94016581. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP), operated by the Fernald Environmental Restoration Management Corporation (FERMCO) for the DOE, was selected as the host site for the Uranium Soils Integrated Demonstration. The Uranium Soils ID was established to develop and demonstrate innovative remediation methods which address the cradle to grave elements involved in the remediation of soils contaminated with radionuclides, principally uranium. The participants in the ID are from FERMCO as well as over 15 other organizations from DOE, private industry and universities. Some of the organizations are technology providers while others are members of the technical support groups which were formed to provide technical reviews, recommendations and labor. The following six Technical Support Groups (TSGs) were formed to focus on the objective of the ID: Characterization, Excavation, Decontamination, Waste Treatment/Disposal, Regulatory, and Performance Assessment. This paper will discuss the technical achievements made to date in the program as well as the future program plans. The focus will be on the realtime analysis devices being developed and demonstrated, the approach used to characterize the physical/chemical properties of the uranium waste form in the soil and lab scale studies on methods to remove the uranium from the soil.

2476 (FEMP-2329) Nuclear criticality safety program for environmental restoration projects. Marble, R.C.; Brown, T.D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. May 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-940602-14; 35. annual meeting of the American Nuclear Society, New Orleans, LA (United States), 11-16 Jun 1994). Order Number DE94015810. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP), formerly known as the Feed Materials Production Center (FMPC), is located on a 1050 acre site approximately twenty miles northwest of Cincinnati, Ohio. The production area of the site covers approximately 136 acres in the central portion of the site. Surrounding the core production area is a buffer consisting of leased grazing land, reforested land, and unused areas. The uranium processing facility was designed and constructed in the early 1950s. During the period from 1952 to 1989 the site produced uranium feed material and uranium products used in the United States weapons complex. Production at the site ended in 1989, when the site was shut down for what was expected to be a short period of time. However, the FUTC was permanently shut down in 1991, and the site's mission was changed from production to environmental restoration. The objective of this paper is to give an update on activities at the Fernald Site and to describe the Nuclear Criticality Safety issues that are currently being addressed.

2477 (FEMP-2336) Ensuring comparability of data generated by multiple analytical laboratories for

environmental decision making at the Fernald Environmental Management Project. Sutton, C.; Campbell, B.A.; Danahy, R.J.; Dugan, T.A.; Tomlinson, F.K. Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-940790-3; 10. annual waste testing and quality assurance symposium, Arlington, VA (United States), 11-15 Jul 1994). Order Number DE94018443. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project is a US Department of Energy (DOE)-owned facility located 17 miles northwest of Cincinnati, Ohio. From 1952 until 1989, the Fernald site provided high-purity uranium metal products to support US defense programs. In 1989 the mission of Fernald changed from one of uranium production to one of environmental restoration. At Fernald, multiple functional programs require analytical data. Inorganic and organic data for these programs are currently generated by seven laboratories, while radiochemical data are being obtained from six laboratories. Quality Assurance (QA) and Quality Control (QC) programs have been established to help ensure comparability of data generated by multiple laboratories at different times. The quality assurance program for organic and inorganic measurements specifies which analytical methodologies and sample preparation procedures are to be used based on analyte class, sample matrix, and data quality requirements. In contrast, performance specifications have been established for radiochemical analyses. A blind performance evaluation program for all laboratories, both on-site and subcontracted commercial laboratories, provides continuous feedback on data quality. The necessity for subcontractor laboratories to participate in the performance evaluation program is a contractual requirement. Similarly, subcontract laboratories are contractually required to generate data which meet radiochemical performance specifications. The Fernald on-site laboratory must also fulfill these requirements.

2478 (FEMP-2387) Standardization of equations for radiochemical calculations. Danahy, R.J. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Dugan, T.A.; Tomlinson, F.K.; Jones, H.W. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-9411105-1; 40. anniversary conference on bioassay, analytical and environmental radiochemistry, Cincinnati, OH (United States), 15-17 Nov 1994). Order Number DE95003028. Source: OSTI; NTIS; INIS; GPO Dep.

In mid 1993, the Fernald Environmental Restoration Management Corporation (FERMCO), with USEPA approval implemented a project quality assurance plan containing performance-based specifications for radiochemical sample analyses conducted in support of the Fernald site remediation activities. FERMCO's initial approach to acquiring performance-based radioanalytical services was to provide limited guidance regarding equations for computation of the quantities required in each analysis report. It became evident that there was a significant divergence of opinion on how to compute some very basic radiochemical quantities. The use of a standardized set of equations was needed in order to ensure comparability of data from different laboratories. In a remediation project of this magnitude, use of multiple laboratories is a virtual necessity. Consequently

comparability of data becomes an extremely important issue. A critical issue in the Remedial Investigation/Feasibility Study (RI/FS) phase of the clean up project is to avoid the occurrence of excessive false positive sample results. Such results could lead to unnecessary clean up and significant additional cost. This paper describes the specific formulas FERMCO is currently using to define such quantities as net sample count rate, sample radionuclide concentration, radio-metric tracer and gravimetric carrier recovery. Equations have also been produced to define the uncertainty in each of the above quantities. Equations for the Total Propagated Uncertainty (TPU) and for a sample-specific Minimum Detectable Concentration (MDC) have also been specified. Generalized equations have been reformulated to address the specific conditions which apply to the analysis of FERMCO samples. In particular, FERMCO requires results which have been corrected for the radioactivity in the blank while in other instances, sample results without blank correction are required.

2479 (INEL-94/0003) Test plan for glove box testing with the real-time transuranic dust monitor. Partin, J.K.; Fincke, J.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008621. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the objectives, instrumentation, and testing procedures used to prove the feasibility of a real-time transuranic dust monitor (RTDM). The RTDM is under development at the Idaho National Engineering Laboratory (INEL) as a Waste Characterization Technology funded by the Buried Waste Integrated Demonstration Project. The instrument is an in situ monitor that uses optical techniques to establish particle size, particle number density, and mass and species of heavy metal contamination. US Department of Energy orders mandate the assessment of radiological exposure and contamination spread during the remediation of radioactive waste. Of particular concern is heavy metal contamination of dust, both radioactive and nonradioactive. Small particles of metal, particularly the radioactive species, tend to become electrically charged and consequently attach themselves to dust particles. This airborne activated dust is a primary means of contamination transport during remediation activities, and therefore, must be continuously monitored to protect personnel involved in the operations and to control the spread of contamination. If real-time monitoring is not available there is increased likelihood of generating unacceptably high levels of contamination and being forced to shut down costly retrieval operations to decontaminate. A series of experiments are described to determine the optimal experimental design, operational parameters, and levels of detection for the RTDM. Initial screening will be performed using monodisperse particle standards to set parameters and calibrate the instrument. Additional testing will be performed using INEL soil samples spiked with a surrogate, cerium oxide, to prove the design before transporting the apparatus to the Test Reactor Area for testing with plutonium-contaminated dusts.

2480 (INEL-94/0014) Summary engineering description of underwater fuel storage facility for foreign research reactor spent nuclear fuel. Dahlke, H.J.; Johnson, D.A.; Rawlins, J.K.; Searle, D.K.; Wachs, G.W. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223.

Order Number DE95008577. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a summary description for an Underwater Fuel Storage Facility (UFSF) for foreign research reactor (FRR) spent nuclear fuel (SNF). A FRR SNF environmental Impact Statement (EIS) is being prepared and will include both wet and dry storage facilities as storage alternatives. For the UFSF presented in this document, a specific site is not chosen. This facility can be sited at any one of the five locations under consideration in the EIS. These locations are the Idaho National Engineering Laboratory, Savannah River Site, Hanford, Oak Ridge National Laboratory, and Nevada Test Site. Generic facility environmental impacts and emissions are provided in this report. A baseline fuel element is defined in Section 2.2, and the results of a fission product analysis are presented. Requirements for a storage facility have been researched and are summarized in Section 3. Section 4 describes three facility options: (1) the Centralized-UFSF, which would store the entire fuel element quantity in a single facility at a single location, (2) the Regionalized Large-UFSF, which would store 75% of the fuel element quantity in some region of the country, and (3) the Regionalized Small-UFSF, which would store 25% of the fuel element quantity, with the possibility of a number of these facilities in various regions throughout the country. The operational philosophy is presented in Section 5, and Section 6 contains a description of the equipment. Section 7 defines the utilities required for the facility. Cost estimates are discussed in Section 8, and detailed cost estimates are included. Impacts to worker safety, public safety, and the environment are discussed in Section 9. Accidental releases are presented in Section 10. Standard Environmental Impact Forms are included in Section 11.

2481 (INEL-94/00025) Integrated spent nuclear fuel database system. Henline, S.P.; Klingler, K.G.; Schierman, B.H. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941207-28: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95008614. Source: OSTI; NTIS; INIS; GPO Dep.

The Distributed Information Systems software Unit at the Idaho National Engineering Laboratory has designed and developed an Integrated Spent Nuclear Fuel Database System (ISNFDS), which maintains a computerized inventory of all US Department of Energy (DOE) spent nuclear fuel (SNF). Commercial SNF is not included in the ISNFDS unless it is owned or stored by DOE. The ISNFDS is an integrated, single data source containing accurate, traceable, and consistent data and provides extensive data for each fuel, extensive facility data for every facility, and numerous data reports and queries.

2482 (INEL-94/0030) Depleted uranium plasma reduction system study. Rekemeyer, P.; Feizollahi, F.; Quapp, W.J.; Brown, B.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). Dec 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008563. Source: OSTI; NTIS; INIS; GPO Dep.

A system life-cycle cost study was conducted of a preliminary design concept for a plasma reduction process for converting depleted uranium to uranium metal and anhydrous HF. The plasma-based process is expected to offer significant economic and environmental advantages over

present technology. Depleted Uranium is currently stored in the form of solid UF_6 , of which approximately 575,000 metric tons is stored at three locations in the U.S. The proposed system is preconceptual in nature, but includes all necessary processing equipment and facilities to perform the process. The study has identified total processing cost of approximately \$3.00/kg. of UF_6 processed. Based on the results of this study, the development of a laboratory-scale system (1 kg/h throughput of UF_6) is warranted. Further scaling of the process to pilot scale will be determined after laboratory testing is complete.

2483 (INEL-94/0105) Plan for the testing of radiation measurement instrumentation intended for use at an excavation site. Gehrke, R.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). Nov 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008560. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes performance tests to be made with ionizing radiation measurement instrumentation designed and built for in-field assay at an excavation site. One instrument measures gross gamma-ray and neutron fields and the other identifies gamma-ray emitting radionuclides and also is capable of assaying for selected hazardous materials. These instruments will be operationally tested to verify that original specifications have been met and performance tested to establish and verify that they have the potential to function as intended at an excavation site.

2484 (INEL-94/0106) Preliminary safety analysis report for the Waste Characterization Facility. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 354p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008691. Source: OSTI; NTIS; INIS; GPO Dep.

This safety analysis report outlines the safety concerns associated with the Waste Characterization Facility located in the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory. The three main objectives of the report are to: define and document a safety basis for the Waste Characterization Facility activities; demonstrate how the activities will be carried out to adequately protect the workers, public, and environment; and provide a basis for review and acceptance of the identified risk that the managers, operators, and owners will assume. 142 refs., 38 figs., 39 tabs.

2485 (INEL-94/0109) Quality Assurance Project Plan for the Gas Generation Testing Program at the INEL. Idaho National Engineering Lab., Idaho Falls, ID (United States). Oct 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008561. Source: OSTI; NTIS; INIS; GPO Dep.

The data quality objectives (DQOs) for the Program are to evaluate compliance with the limits on total gas generation rates, establish the concentrations of hydrogen and methane in the total gas flow, determine the headspace concentration of VOCs in each drum prior to the start of the test, and obtain estimates of the concentrations of several compounds for mass balance purposes. Criteria for the selection of waste containers at the INEL and the parameters that must be characterized prior to and during the tests are described. Collection of gaseous samples from 55-gallon drums of contact-handled transuranic waste for the gas generation testing is discussed. Analytical methods and calibrations are

summarized. Administrative quality control measures described in this QAPjP include the generation, review, and approval of project documentation; control and retention of records; measures to ensure that personnel, subcontractors or vendors, and equipment meet the specifications necessary to achieve the required data quality for the project.

2486 (INEL-94/0203) Soil Sampling Plan for the transuranic storage area soil overburden and final report: Soil overburden sampling at the RWMC transuranic storage area. Stanisich, S.N. Idaho National Engineering Lab., Idaho Falls, ID (United States). Dec 1994. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008556. Source: OSTI; NTIS; INIS; GPO Dep.

This Soil Sampling Plan (SSP) has been developed to provide detailed procedural guidance for field sampling and chemical and radionuclide analysis of selected areas of soil covering waste stored at the Transuranic Storage Area (TSA) at the Idaho National Engineering Laboratory's (INEL) Radioactive Waste Management Complex (RWMC). The format and content of this SSP represents a complementary hybrid of INEL Waste Management-Environmental Restoration Program, and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) sampling guidance documentation. This sampling plan also functions as a Quality Assurance Project Plan (QAPP). The QAPP as a controlling mechanism during sampling to ensure that all data collected are valid, reliable, and defensible. This document outlines organization, objectives and quality assurance/quality control (QA/QC) activities to achieve the desired data quality goals. The QA/QC requirements for this project are outlined in the Data Collection Quality Assurance Plan (DCQAP) for the Buried Waste Program. The DCQAP is a program plan and does not outline the site specific requirements for the scope of work covered by this SSP.

2487 (INIS-JP-018, pp. 398-405) Transportation cask contamination weeping: A program leading to prevention. Bennett, P.C. (Sandia National Lab., Albuquerque, NM (United States)); Doughty, D.H.; Chambers, W.B. 1993. 1709p. (CONF-920905-; PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings*. Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper describes the problem of cask contamination weeping, and efforts to understand the phenomenon and to eliminate its occurrence during spent nuclear fuel transport. The paper summarizes analyses of field experience and scoping experiments, and concentrates on current modelling and experimental validation efforts. (J.P.N.).

2488 (INIS-JP-018, pp. 945-952) Impact-limiting materials characterization. Glass, R.E. (Sandia National Lab., Albuquerque, NM (United States)); Duffey, T.A.; McConnell, P. 1993. 1709p. (CONF-920905-; PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings*. Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Three types of impact-limiting materials have been characterized which have applications in packages for the transport of radioactive materials. These materials are aluminum honeycombs, polyurethane foams, and aluminum foams. The results of the materials characterization have indicated strengths and weaknesses for each type of material. The polyurethane foams provide good impact limiting ability and excellent thermal insulation. However, they burn when subjected to the regulatory thermal event in the presence of air. The aluminum honeycombs provide excellent impact resistance in specific impact orientations. However, they provide relatively poor resistance to thermal assault. Finally, the aluminum foams exhibit relatively poor impact energy absorption capacities, significant variability in energy absorption, and limited thermal insulation. The development of the figures of merit examined the response of the materials to the impact event with the intent of maximizing the energy absorption of the materials with respect to either the volume or mass of the materials. Three figures of merit will be presented for the structural response. The figure of merit for the thermal event is based on minimizing the heat flux to the containment boundary. The paper presents a discussion of the test methods, a summary of the data and the figures of merit for each material. (J.P.N.).

2489 (IS-5090) In-situ monitoring of actinides and rare earth elements by electrothermal hollow cathode discharge spectrometry: Technical progress report. Lee, S.C.; Edelson, M.C. Ames Lab., IA (United States). Dec 1992. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94014239. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes an Electrothermal Hollow Cathode Discharge Spectrometry (ET-HCDS) source being constructed for the analytical determination of actinides and rare earth elements. This work was initiated with the support of the Office of Safeguards and Security; the Buried Waste Integrated Demonstration began funding work in this area in mid-FY1992 and the work is continuing into FY1993 with funds from both sources. Special features of this instrument should permit it to be used for the determination of individual isotopic species, which is important for safeguard's materials control and accountancy. ET-HCDS can be achieved using compact instrumentation suitable for use in field laboratories. The technique is capable of determining a suite of environmentally-important species, such as the actinides and the heavy metals, in a variety of physical forms (e.g., in solution, as found on air particulates, or in soils). ET-HCDS should be capable of very sensitive analyses and should require very small samples (e.g., microgram). Since ET-HCDS is possible in an air atmosphere (at reduced pressures), it may be useful for the real-time determination of hazardous materials, both radioactive and non radioactive, contained in dusts released during waste retrieval operations; ET-HCDS should also be useful for the rapid and sensitive analysis of metals in soils.

2490 (IS-5111) Analysis of waste-vitrification process samples: Improvements in sample preparation and analysis methods. Baldwin, D.P.; Zamzow, D.S.; D'Silva, A.P. Ames Lab., IA (United States). 30 Jun 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010235. Source: OSTI; NTIS; INIS; GPO Dep.

Radwaste vitrification at West Valley requires timely chemical analysis of glass-former materials, waste from the tanks, mixed precursors in slurry form prior to melting, and

shards of the final glass. Since the final glass quality depends on the slurry composition, the slurry analyses must be performed as quickly as possible. Feasibility of alternative analytical methods for the slurry was studied, including rapid dissolution methods combined with direct and pneumatic nebulization of the samples and analysis by inductively coupled plasma atomic emission spectrometry (ICPAES), as well as some laser ablation-ICPAES methods. All methods were evaluated in terms of speed, accuracy, and precision, and applicability in a hot cell or glove box. The digestion procedure and analytical line selection are covered in an appendix.

2491 (IS-5116) High resolution fiber optic interferometer: FY94 final report. Baldwin, D.P.; Zamzow, D.S.; D'Silva, A.P. Ames Lab., IA (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010269. Source: OSTI; NTIS; INIS; GPO Dep.

Objective is a field, on-line high resolution spectrometer system capable of resolving the optical emission from actinide isotopes in an inductively coupled plasma. AOTF (acousto-optic tunable filter) and FFP (fiber optic Fabry-Perot) were combined in this spectrometer, using bulk optical materials. The AOTF-FFP system was tested on U-235/U-238 and RCRA metals. Future development is described; a commercialization plan is attached.

2492 (KCP-613-5329) Department of Energy's process waste assessment graded approach methodology. Pemberton, S.E. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Mar 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. (CONF-940859-8: 5. international symposium on robotics and manufacturing, Maui, HI (United States), 14-18 Aug 1994). Order Number DE94008707. Source: OSTI; NTIS; INIS; GPO Dep.

As the initial phase of the formal waste minimization program, the Department of Energy requires assessments of all its waste-generating operations. These assessments, called process waste assessments (PWAs), are a tool which helps achieve the pollution prevention goals. The DOE complex is comprised of numerous sites located in many different states. The facilities as a whole represent a tremendous diversity of technologies, processes, and activities. Due to this diversity, there are also a wide variety and number of waste streams generated. Many of these waste streams are small, intermittent, and not of consistent composition. The PWA graded approach methodology addresses these complexities and recognizes that processes vary in the quantity of pollution they generate, as well as in the perceived risk and associated hazards. Therefore, the graded approach was developed to provide a cost-effective and flexible methodology which allows individual sites to prioritize their local concerns and align their efforts with the resources allocated. This presentation will describe a project sponsored by the DOE Office of Environmental Restoration and Waste Management, Waste Minimization Division, which developed a graded approach methodology for use throughout the DOE. This methodology was initiated in FY93 through a combined effort of the following DOE/Defense Program sites: Kansas City Plant, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Sandia National Laboratories. This presentation will describe the process waste assessment tool, benefits achieved through the completion of PWAs, DOE's graded approach methodology, and an update on the project's current status.

2493 (LA-12782-MS) Summary performance assessment of in situ remediation technologies demonstrated at Savannah River. Rosenberg, N.D.; Robinson, B.A.; Birdsell, K.H.; Travis, B.J. Los Alamos National Lab., NM (United States). Jun 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94014138. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Technology Development (OTD) in the Department of Energy's (DOE) Office of Environmental Restoration and Waste Management is investigating new technologies for "better, faster, cheaper, safer" environmental remediation. A program at DOE's Savannah River site was designed to demonstrate innovative technologies for the remediation of volatile organic compounds (VOCs) at nonarid sites. Two remediation technologies, in situ air stripping and in situ bioremediation—both using horizontal wells, were demonstrated at the site between 1990–1993. This brief report summarizes the conclusions from three separate modeling studies on the performance of these technologies.

2494 (LA-12821-MS) High performance ground penetrating radar survey of TA-49/Area 2. Final report. Hoeberling, R.F. (Los Alamos National Lab., NM (United States)); Rangel, M.J. III. Los Alamos National Lab., NM (United States). Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006856. Source: OSTI; NTIS; INIS; GPO Dep.

The results of high performance ground penetrating radar study of Area 2 at Technical Area 49 are presented. The survey was commissioned as part of Los Alamos Laboratory's continuing Environmental Remediation program and was completed and analyzed before borehole studies in Area 2 were started. Based upon the ground penetrating radar results, the location of one of the planned boreholes was moved to assure the drilling area was as safe as possible. While earlier attempts to use commercial radar devices at this facility had not been successful, the radar and digital processing system developed at Los Alamos were able to significantly improve the buried physical detail of the site.

2495 (LA-12865) Visible fluorescence of weathered lead. Martin, A.D.; Lyman, J.L. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002454. Source: OSTI; NTIS; GPO Dep.

This experiment explored the possibility of remotely detecting lead fragments by means of an ultraviolet laser or a handheld spectrometer. Lead oxide has a unique fluorescence spectrum (resolution 18 nm), but it does not phosphoresce.

2496 (LA-SUB-94-84) Micromorphology, mineralogy, and genesis of soils and fracture fills and the Pajarito Plateau, New Mexico. Davenport, D.W. (Texas Tech Univ., Lubbock, TX (United States)). Los Alamos National Lab., NM (United States); Texas Tech Univ., Lubbock, TX (United States). Dec 1993. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94013612. Source: OSTI; NTIS; GPO Dep.

The town of Los Alamos, and the Los Alamos National Laboratory (LANL), are located on the Pajarito Plateau in north-central New Mexico. Environmental concerns have recently focused attention on the numerous fractures in the Bandelier Tuff, the series of volcanic rock units that make up

most of the plateau. These fractures have come into question as possible conduits for transport of contaminants downward through the tuff. This study arose out of a need to evaluate the potential for contaminant transport in the fractures. Because the fractures are typically filled, or partially filled, with soil-like material, and appear to be physically continuous with the soils on the surface of the Pajarito Plateau, it was decided to approach the question of the fractures from a soil genesis and morphology standpoint. Specifically, it was believed that soil characterization techniques, including soil micromorphological and mineralogical analyses, could provide information about the dominant processes (past and present) acting in the soils and fractures. The specific objectives of this research were to investigate: (1) the physical, mineralogical and chemical nature of fracture-filling materials in the Banderol Tuff, as well as associated surface soils; (2) the relationships among fracture-fills, tuff bedrock, and surface soils of the Pajarito Plateau; (3) the processes responsible for the development of the fracture-fills; and (4) the likely sequence of events leading to the present morphology of the soils and fracture-fills.

2497 (LA-SUB-94-101) Landslides and other mass movements near TA-33, northern White Rock Canyon, New Mexico. Final report. Dethier, D.P. Los Alamos National Lab., NM (United States); Williams Coll., Williamstown, MA (United States). Sep 1993. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94017053. Source: OSTI; NTIS; GPO Dep.

Massive slump complexes and at least two rock avalanches flank the eastern rim of the Pajarito Plateau along northern White Rock Canyon, north of TA-33. Landslides failed along mechanically weak rocks in the Santa Fe Group, within the Puye Formation, or in Pliocene alluvial and lacustrine units. The landslides are mainly of early or middle Pleistocene age. The toe area of at least one slump complex has been active in the late Pleistocene, damming White Rock Canyon near the mouth of Water Canyon. Lacustrine sediment that filled this lake, or series of lakes, to an elevation of at least 1710 m is preserved at a number of upstream sites, including a deposit near the Buckman townsite that exposes 30 m of lacustrine sediment. Charcoal collected at several sites has been submitted for ^{14}C dating. Landslides, however, probably do not represent a significant short-term threat to the material disposal areas at TA-33. Bedrock that lies beneath the TA-33 mesa is relatively stable, the mesa shows no signs of incipient failure, and past periods of slide activity were responses to rapid downcutting of the Rio Grande and climate change, probably over periods of several decades, at least. Rockfall and headward erosion of gullies do not represent significant decadal hazards on canyon rims near TA-33. Gully migration near MDA-K is a potential threat, but the gullies were not examined in detail. A system of north-trending faults, at least one of which displays Pleistocene activity, bisects the TA-33 mesa. If these faults are capable of producing significant seismic shaking, generalizations about landslide and rockfall hazards must be reevaluated.

2498 (LA-SUB-95-30) Separation of technetium from nuclear waste stream simulants. Final report. Strauss, S.H. (Colorado State Univ., Fort Collins, CO (United States). Dept. of Chemistry). Los Alamos National Lab., NM (United States); Colorado State Univ., Fort Collins, CO (United States). Dept. of Chemistry. 30 Sep 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

W-7405-ENG-36. Order Number DE95007645. Source: OSTI; NTIS; INIS; GPO Dep.

The authors evaluated several calorimetric assays for ReO_4^- , and discovered that all were flawed. They evaluated atomic absorption spectroscopy as a technique to determine sub-millimolar concentrations of ReO_4^- , and discovered that it is not sensitive enough for their use. However, they discovered that ICP-AES can be used to determine concentrations of ReO_4^- down to 0.25 ppm. They next determined that ReO_4^- can be quickly extracted (10 minutes or less) from aqueous HNO_3 using the commercial extractant Aliquat-336 nitrate diluted with 1,3-diisopropylbenzene. Higher concentrations of extractant led to higher values of K_d (the distribution ratio). K_d was lower as the nitrate concentration of the medium increased, and was also lowered by increasing the acidity at constant nitrate ion concentration. The authors performed parallel studies with TcO_4^- , determining that $K_d(\text{ReO}_4^-)$ and $K_d(\text{TcO}_4^-)$ track similarly as the conditions are changed. An effort was made to prepare substituted pyridium nitrate salts that are soluble in organic solvents to be used as alternate extractants. However, in all cases but one, the salts were also soluble to some extent in the aqueous phase, significantly limiting their usefulness as extractants for these purposes. Many of the new extractant salts would partition between the organic solvent and water so that 10% of the extractant salt was in the aqueous phase. Only 1-methyl-3,5-didodecylpyridium nitrate did not show any measurable solubility in water. However, this compound was not as good an extractant as Aliquat-336. A considerable effort was also made to find suitable alternative solvents to 1,3-diisopropylbenzene. Several ketone solvents with flash points above 60 C were tested, and two of these, 2-nonanone and 3-nonanone, were superior to 1,3-diisopropylbenzene as a diluent.

2499 (LA-UR-94-228) Phase report 1C, TA-21 operable unit RCRA Facility Investigation, Outfalls Investigation. Los Alamos National Lab., NM (United States). 28 Feb 1994. 610p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95003752. Source: OSTI; NTIS; INIS; GPO Dep.

This phase report summarizes the results of field investigations conducted in 1992 at Technical Area 21 of Los Alamos National Laboratory, as prescribed by the RCRA Facility Investigation work plan for the Technical Area 21 operable unit (also known as OU 1106). This phase report is the last part of a three-part phase report describing the results of field work conducted in 1992 at this operable unit. Phase Report 1A, issued on 14 June 1993, summarized site geologic characterization activities. Phase report 1B, issued on 28 January 1994, included an assessment of site-wide surface soil background, airborne emissions deposition, and contamination in the locations of two former air filtration buildings. The investigations assessed in Phase Report 1C include field radiation surveys and surface and near-surface sampling to characterize potential contamination at 25 outfalls and septic systems listed as SWMUs in the RFI work plan. Based on the RFI data, it is recommended that no further action is warranted for 8 SWMUs and further action is recommended for 3 SWMUs addressed in this phase report. For 14 SWMUs which represent no immediate threat to human health or environment, deferral of further action/no further action decisions is recommended until outstanding analytical data are received, sampling of adjacent SWMUs is completed, or decisions are made about the baseline risk assessment approach.

2500 (LA-UR-94-1093) Cobalt dicarbollide containing polymer resins for cesium and strontium uptake. Steckle, W.P. Jr.; Duke, J.R. Jr.; Jorgensen, B.S. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940813-2: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE94009326. Source: OSTI; NTIS; INIS; GPO Dep.

Cobalt(III) dicarbollide $[(C_2B_9H_{11})_2Co]^+$ (CB_2) is being investigated for Cs and Sr extraction from nuclear waste. Because organic solvents should be avoided, bonding of CB_2 to resins were investigated. CB_2 was successfully covalently bonded to polystyrene and polybenzimidazole resins. Tetrahydrofuran was the most efficient solvent for grafting. Analysis is being performed, and separation coefficients are also being determined. 3 figs, 8 refs.

2501 (LA-UR-94-1510) Best available technology for the Los Alamos National Laboratory Radioactive Liquid Waste Treatment Facility. Midkiff, W.S.; Romero, R.L.; Suazo, I.L.; Garcia, R.; Parsons, R.M. Los Alamos National Lab., NM (United States). 15 Oct 1993. 373p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95003754. Source: OSTI; NTIS; INIS; GPO Dep.

The existing Los Alamos National Laboratory TA-50 liquid radioactive waste treatment plant RLWP has been in service for over thirty years, during this period many technical, regulatory, and processing changes have occurred. The existing facility can no longer comply with the demands and requirements for continued operation, and would not be able to comply with anticipated stringent future contaminant discharge limitations. Either a major upgrading or replacement of the existing facility is required. In order to assess the most appropriate means of providing an adequate facility to comply with predicted requirements for Ta-50, this Best Available Technology (BAT) Study was conducted to compare feasible technical and economic alternatives in order to define the most favorable technology configuration. This report consists of eleven sections. Section 1 provides a general introduction and background of the TA-50 operations and the basis for this study. Section 2 provides a technical discussion of the unit processes at TA-50 and several other comparable operations at other DOE sites. Section 3 addresses the evaluation and selection of appropriate treatment processes. Section 4 provides an analysis of environmental issues and concerns. Section 5 presents the rationale for the selection of preferred process configurations. Section 6 is the evaluation of operational issues. Section 7 addresses energy and resource use topics. Section 8 provides an economic analysis, and Section 9 summarizes the evaluation and the identification of the BAT. These sections are augmented by appendices. The report identifies the construction of a new radioactive liquid waste treatment facility as the BAT. Based on the information analyzed for this study, this option appears to provide the best combination of environmental compliance, operability, and economic value.

2502 (LA-UR-94-1544) RCRA materials analysis by laser-induced breakdown spectroscopy: Detection limits in soils. Koskelo, A.; Cremers, D.A. Los Alamos National Lab., NM (United States). [1994]. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94018613. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of the Technical Task Plan (TTP) that this report supports is research, development, testing and evaluation of a portable analyzer for RCRA and other metals. The instrumentation to be built will be used for field-screening of soils. Data quality is expected to be suitable for this purpose. The data presented in this report were acquired to demonstrate the detection limits for laser-induced breakdown spectroscopy (LIBS) of soils using instrument parameters suitable for fieldable instrumentation. The data are not expected to be the best achievable with the high pulse energies available in laboratory lasers. The report presents work to date on the detection limits for several elements in soils using LIBS. The elements targeted in the Technical Task Plan are antimony, arsenic, beryllium, cadmium, chromium, lead, selenium, and zirconium. Data for these elements are presented in this report. Also included are other data of interest to potential customers for the portable LIBS apparatus. These data are for barium, mercury, cesium and strontium. Data for uranium and thorium will be acquired during the tasks geared toward mixed waste characterization.

2503 (LA-UR-94-1749) On the road to WIPP: Or remote packaging of transuranic waste. Ledbetter, J.M.; Field, L.R. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940630-6: 11. topical meeting on the technology of fusion energy, New Orleans, LA (United States), 19-24 Jun 1994). Order Number DE94012904. Source: OSTI; NTIS; INIS; GPO Dep.

At the Los Alamos National Laboratory (LANL) Hot Cell facility, highly productive programs in reactor research spanning three decades have generated appreciable quantities of legacy waste. Hot cell capability had become virtually useless due to the storage of this waste. As a result of concentrated efforts by LANL staff, in cooperation with Westinghouse Waste Isolation Pilot Plant (WIPP), a solution was arrived at that allowed the facility to become productive once again. Equipment has been designed and fabricated to remotely handle 55-gal. waste drums, load waste canisters, perform canister weld closure, leak test welds, grapple the waste canister and transport the canister to an interim storage site. It is our contention that the technology and acquired equipment produced from this effort should be used to further benefit other DOE sites.

2504 (LA-UR-94-2691) The development of an innovative, real-time monitor for airborne alpha emissions. Gritzo, R.; Fowler, M.; Wouters, J. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940528-6: 13. international symposium on thermal treatment technologies, Houston, TX (United States), 9-13 May 1994). Order Number DE94018075. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory (LANL) is developing a technology for on-line, real-time monitoring of incinerator stacks for low levels of airborne alpha activity. Referred to as the Large-Volume Flow Thru Detector System (LVFTDS), this technology uses a unique design for sensitive, real-time measurements of alpha particle emissions. Scintillating plates are stacked close together so that alpha-particle emissions in the flowing gas stream strike a plate. The light pulses produced when the alpha particle strikes the plate are registered by photomultiplier tubes and processed to determine the concentration of alpha emitting radionuclides present in the air. This technology directly addresses the public's demand for fast responding, high sensitivity effluent

monitoring systems. With Department of Energy (DOE) EM-50 funding LANL has fabricated a beach-top proof of concept detector system and is conducting tests to evaluate its performance. A second generation prototype is being designed, based on requirements driven by potential field test sites. An industrial partner is being solicited to license the technology. Field trials of a full-scale detector system are planned for fiscal year 1995. In this paper the LVFTDS technology is explained, including the measured performance of a prototype detector. The advantages, disadvantages, and other ramifications of applying this technology to incinerator effluent monitoring are also discussed. An overview of the development effort is also provided.

2505 (LA-UR-94-3637) Radon monitoring using long-range alpha detector-based technology. Bolton, R.D. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941061-6: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 Nov 1994). Order Number DE95002729. Source: OSTI; NTIS; INIS; GPO Dep.

Long-Range Alpha Detector (LRAD) technology is being studied for monitoring radon gas concentrations. LRAD-based instruments collect and measure the ionization produced in air by alpha decays. These ions can be moved to a collection grid via electrostatic ion-transport design collected approximately 95% of the radon produced ions, while instruments using an airflow transport design collected from 44% to 77% of these ions, depending on detector geometry. The current produced by collecting this ionization is linear with respect to ^{222}Rn concentration over the available test range of 0.07 to 820 pCi/L. In the absence of statistical limitations due to low radon concentrations, the speed of response of LRAD-based instruments is determined by the air exchange rate, and therefore changes in radon concentration can be detected in just a few seconds. Recent tests show that at radon concentrations below 20 pCi/L current pulses produced by individual alpha decays can be counted, thus improving detector sensitivity and stability even further. Because these detectors are simple, rugged, and do not consume much power, they are natural candidates for portable, battery operation.

2506 (LA-UR-95-107) Detection of contaminants along boreholes with prompt gamma spectroscopy. Conaway, J. (Los Alamos National Lab., NM (United States)); George, D.; Mikesell, J. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950601-4: Annual meeting of the American Nuclear Society (ANS), Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95006297. Source: OSTI; NTIS; INIS; GPO Dep.

Geophysical borehole logging techniques are used for estimating subsurface physical, chemical, geological, and hydrological parameters. Nuclear borehole logging techniques have advantages and disadvantages that tend to be complementary to those of physical sampling and these in situ measurements can help address the drawbacks of physical sampling, including high costs, lengthy delays in obtaining results of analyses from laboratories/under sampling, sample handling problems, and ambiguity in long-term monitoring. As part of an effort to reduce environmental restoration costs, we are evaluating in-situ neutron-induced gamma-ray spectroscopy (multispectral) measurements in boreholes to map environmental contaminants. It has been

known for some time that this technology is capable of identifying many elements, but earlier borehole equipment was not very sensitive.

2507 (LA-UR-95-174) Alpha characterization inside pipes using ion-transport technology. Rojas, S.P.; Rawool-Sullivan, M.W.; Williams, K.G.; Vaccarella, J.A. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-69: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95007869. Source: OSTI; NTIS; INIS; GPO Dep.

Many DOE facilities have several miles of waste pipe systems that are internally contaminated with various and often undetermined radio nuclides. Unfortunately, currently acceptable alpha detection technologies are inefficient, time consuming, and do not address the problems presented by small diameter or curved pipes. In general, the problem of detecting alpha contamination on the inside surface of pipes is complicated by the fact that alphas do not penetrate the pipe walls. Unlike their conventional counterparts, alpha detectors based on ion transport technology sense alpha particles by collecting the ions created in ambient air as the particle loses its kinetic energy. The ions inside the pipe are transported by a fan-generated air current to an electrode inside the detector, which is attached to one end of the pipe. The collected charge at the electrode is proportional to the number of ions created inside the pipe, which in turn is proportional to the number of alphas emitted. Typically, monitoring for alpha contamination inside pipes or ductwork involves disrupting the operation to access as much surface area as possible for standard alpha monitoring. The detector based on ion transport technology effectively minimizes such disruption and in many circumstances will allow for in situ monitoring of a system that might otherwise not be practically accessible to standard methods.

2508 (LBL-35384) Expedited Site Characterization geophysics: Geophysical methods and tools for site characterization. Goldstein, N.E. Lawrence Berkeley Lab., CA (United States). Mar 1994. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94011624. Source: OSTI; NTIS; GPO Dep.

This report covers five classes of geophysical technologies: Magnetism; Electrical/electromagnetic; Seismic reflection; Gamma-ray spectrometry; and Metal-specific spectrometry. Except for radiometry, no other classes of geophysical technologies are specific for direct detection of the types of contaminants present at the selected sites. For each of the five classes covered, the report gives a general description of the methodology, its field use, and its general applicability to the ESC Project. In addition, the report gives a sample of the most promising instruments available for each class, including the following information: Hardware/software attributes; Purchase and rental costs; Survey rate and operating costs; and Other applicable information based on case history and field evaluations.

2509 (ORNL/ER-120) Summary of available waste forecast data for the Environmental Restoration Program at the Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Aug 1994. 163p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95000442. Source: OSTI; NTIS; INIS; GPO Dep.

This report identifies patterns of Oak Ridge National Laboratory (ORNL) Environmental Restoration (ER) waste generation that are predicted by the current ER Waste Generation Forecast data base. It compares the waste volumes to be generated with the waste management capabilities of current and proposed treatment, storage, or disposal (TSD) facilities. The scope of this report is limited to wastes generated during activities funded by the Office of the Deputy Assistant Secretary for Environmental Restoration (EM-40) and excludes wastes from the decontamination and decommissioning of facilities. Significant quantities of these wastes are expected to be generated during ER activities. This report has been developed as a management tool supporting communication and coordination of waste management activities at ORNL. It summarizes the available data for waste that will be generated as a result of remediation activities under the direction of the U.S. Department of Energy Oak Ridge Operations Office and identifies areas requiring continued waste management planning and coordination. Based on the available data, it is evident that most remedial action wastes leaving the area of contamination can be managed adequately with existing and planned ORR waste management facilities if attention is given to waste generation scheduling and the physical limitations of particular TSD facilities. Limited use of off-site commercial TSD facilities is anticipated, provided the affected waste streams can be shown to satisfy the requirements of the performance objective for certification of non-radioactive hazardous waste and the waste acceptance criteria of the off-site facilities. Ongoing waste characterization will be required to determine the most appropriate TSD facility for each waste stream.

2510 (ORNL/ER-291) Surface radiological investigations at the 0816 Site, Waste Area Grouping 13, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Tiner, P.F.; Uziel, M.S. Oak Ridge National Lab., TN (United States). Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005693. Source: OSTI; NTIS; INIS; GPO Dep.

A surface radiological investigation was conducted intermittently from July through September 1994 at the 0816 site, located within Waste Area Grouping (WAG) 13. The survey was performed by members of the Measurement Applications and Development Group, Health Sciences Research Division, Oak Ridge National Laboratory (ORNL) at the request of ORNL Site Environmental Restoration Program Facility Management. The purpose of the survey was to ascertain and document the surface radiological condition of the site subsequent to remedial action activities completed in May 1994. The survey was designed to determine whether any residual surface soil contamination in excess of 120 pCi/g ¹³⁷Cs (Specified by the Interim Record of Decision) remained at the site.

2511 (ORNL/M-3763) Ecological risks of DOE's programmatic environmental restoration alternatives. Oak Ridge National Lab., TN (United States). Jun 1994. 281p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94018408. Source: OSTI; NTIS; INIS; GPO Dep.

This report assesses the ecological risks of the Department of Energy's (DOE) Environmental Restoration Program. The assessment is programmatic in that it is directed at evaluation of the broad programmatic alternatives outlined in the DOE Implementation Plan. It attempts to (1) characterize the ecological resources present on DOE facilities, (2) describe the occurrence and importance of

ecologically significant contamination at major DOE facilities, (3) evaluate the adverse ecological impacts of habitat disturbance caused by remedial activities, and (4) determine whether one or another of the programmatic alternatives is clearly ecologically superior to the others. The assessment focuses on six representative facilities: the Idaho National Engineering Laboratory (INEL); the Fernald Environmental Management Project (FEMP); the Oak Ridge Reservation (ORR), including the Oak Ridge National Laboratory (ORNL), Y-12 plant, and K-25 plant; the Rocky Flats Plant; the Hanford Reservation; and the Portsmouth Gaseous Diffusion Plant.

2512 (ORNL/RASA-94/2) Results of the independent verification survey at the Old Betatron Building, Granite City, Illinois. Murray, M.E.; Brown, K.S. Oak Ridge National Lab., TN (United States). Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94016319. Source: OSTI; NTIS; INIS; GPO Dep.

A team from the Measurement Applications and Development Group, Oak Ridge National Laboratory (ORNL), conducted an independent verification of the radiological condition of the Old Betatron Building, Granite City, Illinois, at the request of the Department of Energy in June of 1993. The building is owned by the National Steel Corporation. The contamination present resulted from the handling of uranium slabs of metal during the time the betatron facility was used to x-ray the slabs for metallurgical defects. The designation survey did not characterize the entire floor space because of obstructing equipment and debris. Therefore, prior to remediation by Bechtel National, Incorporated (BNI), a thorough characterization of the floor was conducted, and the results were immediately conveyed to on-site staff of BNI. An independent verification assessment was also performed after the cleanup activities were performed under the direction of BNI. The process of characterization, remediation, and verification was accomplished within a five-day period. Based on results of the independent verification assessment, the Old Betatron Building was determined to meet the DOE radiological guidelines for unrestricted use.

2513 (ORNL/TM-12759) Final waste forms project: Performance criteria for phase I treatability studies. Gilliam, T.M. (Oak Ridge National Lab., TN (United States)); Hutchins, D.A.; Chodak, P. III. Oak Ridge National Lab., TN (United States). Jun 1994. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94015934. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the product performance criteria to be used in Phase I of the Final Waste Forms Project. In Phase I, treatability studies will be performed to provide "proof-of-principle" data to establish the viability of stabilization/solidification (S/S) technologies. This information is required by March 1995. In Phase II, further treatability studies, some at the pilot scale, will be performed to provide sufficient data to allow treatment alternatives identified in Phase I to be more fully developed and evaluated, as well as to reduce performance uncertainties for those methods chosen to treat a specific waste. Three main factors influence the development and selection of an optimum waste form formulation and hence affect selection of performance criteria. These factors are regulatory, process-specific, and site-specific waste form standards or requirements. Clearly, the optimum waste form formulation will require consideration of performance criteria constraints from each of the

three categories. Phase I will focus only on the regulatory criteria. These criteria may be considered the minimum criteria for an acceptable waste form. In other words, a S/S technology is considered viable only if it meet applicable regulatory criteria. The criteria to be utilized in the Phase I treatability studies were primarily taken from Environmental Protection Agency regulations addressed in 40 CFR 260 through 265 and 268; and Nuclear Regulatory Commission regulations addressed in 10 CFR 61. Thus the majority of the identified criteria are independent of waste form matrix composition (i.e., applicable to cement, glass, organic binders etc.).

2514 (ORNL/TM-12792) Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department. Bartling, M.H.; Bayne, C.K.; Cunningham, G.R. Oak Ridge National Lab., TN (United States). Sep 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002512. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the sampling and analytical procedures needed for the initial characterization of the filter press cake waste from the Process Waste Treatment Plant (PWTP) at the Oak Ridge National Laboratory (ORNL). It is anticipated that revisions to this document will occur as operating experience and sample results suggest appropriate changes be made. Application of this document will be controlled through the ORNL Waste Management and Remedial Action Division. The sampling strategy is designed to ensure that the samples collected present an accurate representation of the waste process stream. Using process knowledge and preliminary radiological activity screens, the filter press cake waste is known to contain radionuclides. Chemical characterization under the premise of this sampling and analysis plan will provide information regarding possible treatments and ultimately, disposal of filter press cake waste at an offsite location. The sampling strategy and analyses requested are based on the K-25 waste acceptance criteria and the Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements [2, NVO-325, Rev. 1]. The sampling strategy will demonstrate that for the filter press cake waste there is (1) an absence of RCRA and PCBs wastes, (2) an absence of transuranic (TRU) wastes, and (3) a quantifiable amount of radionuclide activity.

2515 (ORNL/TM-12817, pp. 141-150) New phosphate glass dosimeter systems for routine individual and environmental monitoring. Burgkhardt, B. (Karlsruhe Nuclear Research Centre (Germany)); Piesch, E.; Ugi, S.; Ishikawa, T.; Ikegami, T.; Omori, T. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Two recently developed photoluminescent dosimeter (PLD) systems are now commercially available which similar to conventional TLD systems allow a fully automatic readout and data evaluation: (a) The one-element dosimeter SC-1 makes use of a perforated tin filter for the simultaneous measurement of the exposure X and $H_p(10)$ in the photon energy range 25 keV and 12 keV to 1.3 MeV, respectively, allowing in addition an automatic scanning of the glass, horizontally and vertically, for estimating radiation quality and direction of radiation incidence. The system is pattern approved by the PTB and applied by two German dosimetry services. (b)

The four-element dosimeter GD-400 uses metal and plastic filters of different thicknesses. The linear combination of the detector readings allows the energy independent measurement of exposure X or $H_p(10)$ for photons and $H_p(0.07)$ for beta rays and photons. The pulsed UV laser excitation permits a suppression of the intrinsic pre-dose reading and for annealed glasses the coefficient of variation is 10% at 30 μ Sv. Routine results are presented for PLD and electronic personal dosimeters worn simultaneously in controlled areas of nuclear power stations. With respect to long-term environmental monitoring PLD and TLD systems are compared in the temperature dependent fading characteristics, the self-irradiation and the response to cosmic rays.

2516 (ORNL/TM-12817, pp. 237) Minimum detectable activity of portable contamination survey instruments. Johnson, M.L. (Pacific Northwest Lab., Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes methods for, and results from determining the minimum detectable activity of portable contamination survey instruments. The instruments examined are the pancake Geiger Mueller detector and a 50 square-cm zinc sulfide alpha scintillator. This paper presents MDAs for two different survey methodologies; a scanning survey and a 5-second static count method. Determination of the MDA combines empirical measurements of the minimum count rate detectable by a technician with laboratory measurements of instrument efficiencies. Minimum detectable count rates were measured for both point and distributed sources and for both scanning and static survey methods. The MDA for the scanning survey was calculated for several scan speeds ranging from 2.5 cm/s to 20 cm/s. The results presented in this paper were used to develop a survey methodology that meets the surface contamination guideline values of the DOE Radiological Control Manual.

2517 (ORNL/TM-12817, pp. 381-396) Harshaw/Bicron 8807 environmental dosimeter - Implementation issues. Lawson, B.J. (Knolls Atomic Power Lab., Schenectady, NY (United States)); Moleski, M.; Karandy, R.; Phillips, C.R.; Champagne, R.; Winslow, R.J. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides details regarding implementation of the Harshaw/Bicron 8807 dosimeter for field use in an environmental monitoring program. The paper discusses special precautions which must be taken to ensure accuracy and reproducibility. Specifically, light sensitivity should be eliminated and temperature dependent fade accounted for. Seasonal bias of +15% to +50% can result if this is not done.

2518 (ORNL/TM-12817, pp. 397-406) Methodology for performing surveys for fixed contamination. Durham, J.S. (Pacific Northwest Lab., Richland, WA (United States)); Gardner, D.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In

Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a methodology for performing instrument surveys for fixed contamination that can be used to support the release of material from radiological areas, including release to controlled areas and release from radiological control. The methodology, which is based on a fast scan survey and a series of statistical, fixed measurements, meets the requirements of the U.S. Department of Energy Radiological Control Manual (RadCon Manual) (DOE 1994) and DOE Order 5400.5 (DOE 1990) for surveys for fixed contamination and requires less time than a conventional scan survey. The confidence interval associated with the new methodology conforms to the draft national standard for surveys. The methodology that is presented applies only surveys for fixed contamination. Surveys for removable contamination are not discussed, and the new methodology does not affect surveys for removable contamination.

2519 Ice electrode electrolytic cell. Glenn, D.F.; Suci, D.F.; Harris, T.L.; Ingram, J.C. To Dept. of Energy. 1992. Filed date 22 Jul 1992. U.S. Patent Application 7-917,243. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94016133. Source: OSTI; NTIS; INIS; GPO Dep.

This invention relates to a method and apparatus for removing heavy metals from waste water, soils, or process streams by electrolytic cell means. The method includes cooling a cell cathode to form an ice layer over the cathode and then applying an electric current to deposit a layer of the heavy metal over the ice. The metal is then easily removed after melting the ice. In a second embodiment, the same ice-covered electrode can be employed to form powdered metals.

2520 Monitoring and analyzing waste glass compositions. Schumacher, R.F. To Dept. of Energy. 1992. Filed date 21 Aug 1992. U.S. Patent Application 7-933,153. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94016119. Source: OSTI; NTIS; INIS; GPO Dep.

A device and method for determining the viscosity of a fluid, preferably molten glass. The apparatus and method uses the velocity of rising bubbles, preferably helium bubbles, within the molten glass to determine the viscosity of the molten glass. The bubbles are released from a tube positioned below the surface of the molten glass so that the bubbles pass successively between two sets of electrodes, one above the other, that are continuously monitoring the conductivity of the molten glass. The measured conductivity will change as a bubble passes between the electrodes enabling an accurate determination of when a bubble has passed between the electrodes. The velocity of rising bubbles can be determined from the time interval between a change in conductivity of the first electrode pair and the second, upper electrode pair. The velocity of the rise of the bubbles in the glass melt is used in conjunction with other physical characteristics, obtained by known methods, to determine the viscosity of the glass melt fluid and, hence, glass quality.

2521 (PB-94-173093/XAB) Locating and estimating air emissions from sources of cadmium and cadmium compounds. Final report. Jones, R.; Lapp, T.; Wallace, D. Midwest Research Inst., Cary, NC (United States). Sep

1993. 312p. Contract EPA-68-D2-0159. Source: NTIS Prices: PC A14/MF A03.

The document deals with cadmium and cadmium compounds; however, the majority of the information contained in this document concerns cadmium. Sources of cadmium emissions evaluated in this document include: (1) cadmium production and uses processes; (2) emissions from combustion sources; (3) production of other nonferrous metals where cadmium emissions result as inadvertent byproducts of the process; (4) production processes for selected materials other than nonferrous metals; and (5) mobile sources. Data presented in this document are total cadmium emissions and do not differentiate the metallic and ionic forms of cadmium.

2522 (PNL-8902) In Situ Remediation Integrated Program, Evaluation and assessment of containment technology. Gerber, M.A.; Fayer, M.J. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94011438. Source: OSTI; NTIS; INIS; GPO Dep.

The In Situ Remediation Integrated Program (ISRIP) was established by the US Department of Energy (DOE) to advance the state-of-the art of innovative in situ remediation technologies to the point of demonstration and to broaden the applicability of these technologies to the widely varying site remediation requirements throughout the DOE complex. This program complements similar ongoing integrated demonstration programs being conducted at several DOE sites. The ISRIP has been conducting baseline assessments on in situ technologies to support program planning. Pacific Northwest Laboratory conducted an assessment and evaluation of subsurface containment barrier technology in support of ISRIP's Containment Technology Subprogram. This report summarizes the results of that activity and provides a recommendation for prioritizing areas in which additional research and development is needed to advance the technology to the point of demonstration in support of DOE's site restoration activities.

2523 (PNL-8996) Evaluation of the potential for gas pressurization and free liquid accumulation in a WVDP canister. Hazelton, R.F.; Thornhill, C.K. Pacific Northwest Lab., Richland, WA (United States). Dec 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94014992. Source: OSTI; NTIS; INIS; GPO Dep.

A full-scale canister provided by the West Valley Demonstration Project, filled during the SF-11 vitrification qualification test, was tested to determine its potential for gas generation (non-radiolytic only) and liquid accumulation. The canister was sealed and held at a temperature of about 500°C for eight weeks. Gas samples obtained during the test were analyzed using mass spectroscopy to determine the composition of gases within the canister. At the end of the eight weeks the canister gases were evacuated through a desiccant to capture any water that had been released by the glass during the test. In addition, an analysis of the glass using fourier transform infrared spectroscopy was performed to determine the water content in the glass both before and after the temperature exposure.

2524 (PNL-9336) Hanford Permanent Isolation Barrier Program: Asphalt technology test plan. Freeman, H.D.; Romine, R.A. Pacific Northwest Lab., Richland, WA (United States). May 1994. 36p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94013454. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Permanent Isolation Barriers use engineered layers of natural materials to create an integrated structure with backup protective features. The objective of current designs is to develop a maintenance-free permanent barrier that isolates wastes for a minimum of 1000 years by limiting water drainage to near-zero amounts. Asphalt is being used as an impermeable water diversion layer to provide a redundant layer within the overall barrier design. Data on asphalt barrier properties in a buried environment are not available for the required 100-year time frame. The purpose of this test plan is to outline the activities planned to obtain data with which to estimate performance of the asphalt layers.

2525 (PNL-9787) USTID waste dislodging and conveyance FY 1993 technology development summary report. Powell, M.R. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94017392. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the testing and conclusions that resulted from the FY 1993 waste dislodging and conveyance technology development testing. The final FY 1993 reports from the various waste dislodging and conveyance technology development tasks are attached to this document as appendices.

2526 (PNL-9821) Evaluation of pressure transducers to measure surface level in the waste storage tanks. Peters, T.J.; Colson, J.B. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94015194. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of tests conducted at the Pacific Northwest Laboratory (PNL) to determine if pressure transducers can be used to measure the surface level in the waste tanks. A survey was first conducted to evaluate which, if any, commercially available pressure transducers were available that could meet the requirements for use in the waste tanks. More than 35 companies were contacted to determine if they manufactured a pressure transducer that could be used in the 101-SY waste tank. The three basic requirements for a pressure transducer for this application were that they were radiation-hardened, could withstand a caustic environment, and were certified to be intrinsically safe. No manufacturer was able to meet all three of these requirements with a commercially available product. Seven companies were able to meet the requirements for being radiation-hardened and being able to withstand the caustic environment. However, only two of the nine companies were willing to supply a pressure transducer for laboratory testing. The two pressure transducers that were tested in this program were the VEGA D36-38 from HiTech Technologies, Inc., and the KP-1911-A from Kaman Instrumentation Corporation. Pressure transducers operate on the principle that the pressure at the location of a sensor increases directly with the depth of the liquid above it. A liquid is required in order for these devices to operate. For these tests, water was first used to determine the ideal operation of the devices, then the devices were placed in a 101-SY waste tank simulant. The simulant had a specific gravity of 1.96 and had the consistency similar to the convective layer in the 101-SY waste

tank. In order to determine the surface level with pressure transducers, the density of the material needs to be known.

2527 (PNL-9822) Preliminary melter performance assessment report. Elliott, M.L.; Eyer, L.L.; Mahoney, L.A.; Cooper, M.F.; Whitney, L.D.; Shafer, P.J. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 455p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94019131. Source: OSTI; NTIS; INIS; GPO Dep.

The Melter Performance Assessment activity, a component of the Pacific Northwest Laboratory's (PNL) Vitrification Technology Development (PVT) effort, was designed to determine the impact of noble metals on the operational life of the reference Hanford Waste Vitrification Plant (HWVP) melter. The melter performance assessment consisted of several activities, including a literature review of all work done with noble metals in glass, gradient furnace testing to study the behavior of noble metals during the melting process, research-scale and engineering-scale melter testing to evaluate effects of noble metals on melter operation, and computer modeling that used the experimental data to predict effects of noble metals on the full-scale melter. Feed used in these tests simulated neutralized current acid waste (NCAW) feed. This report summarizes the results of the melter performance assessment and predicts the lifetime of the HWVP melter. It should be noted that this work was conducted before the recent Tri-Party Agreement changes, so the reference melter referred to here is the Defense Waste Processing Facility (DWPF) melter design.

2528 (PNL-9874) Review and assessment of technologies for the separation of cesium from acidic media. Orth, R.J.; Brooks, K.P.; Kurath, D.E. Battelle Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000317. Source: OSTI; NTIS; INIS; GPO Dep.

A preliminary literature survey has been conducted to identify and evaluate methods for the separation of cesium from acidic waste. The most promising solvent extraction, precipitation, and ion exchange methods, along with some of the attributes for each method, are listed. The main criteria used in evaluating the separation methods were as follows: (1) good potential for cesium separation must be demonstrated (i.e., cesium decontamination factors on the order of 50 to 100). (2) Good selectivity for cesium over bulk components must be demonstrated. (3) The method must show promise for evolving into a practical and fairly simple process. (4) The process should be safe to operate. (5) The method must be robust (i.e., capable of separating cesium from various acidic waste types). (6) Secondary waste generation must be minimized. (7) The method must show resistance to radiation damage. The most promising separation methods did not necessarily satisfy all of the above criteria, thus key areas requiring further development are suggested for each method. The report discusses in detail these and other areas requiring further development, as well as alternative solvent extraction, precipitation, ion exchange, and 'other' technologies that, based on current information, show less promise for the separation of cesium from acidic wastes because of significant process limitations. When appropriate, the report recommends areas of future development.

2529 (PNL-9998) Imaging through obscurations for sluicing operations in the waste storage tanks. Peters,

T.J.; McMakin, D.L.; Sheen, D.M.; Chieda, M.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94017780. Source: OSTI; NTIS; INIS; GPO Dep.

Waste remediators have identified that surveillance of waste remediation operations and periodic inspections of stored waste are required under very demanding and difficult viewing environments. In many cases, obscurants such as dust or water vapor are generated as part of the remediation activity. Methods are required for viewing or imaging beyond the normal visual spectrum. Work space images guide the movement of remediation equipment, creating a need for rapidly updated, near real-time imaging capability. In addition, there is a need for three-dimensional topographical data to determine the contours of the wastes, to plan retrieval campaigns, and to provide a three-dimensional map of a robot's work space as basis for collision avoidance. Three basic imaging techniques were evaluated: optical, acoustic and radar. The optical imaging methods that were examined used cameras which operated in the visible region and near-infrared region and infrared cameras which operated in the 3–5 micron and 8–12 micron wavelength regions. Various passive and active lighting schemes were tested, as well as the use of filters to eliminate reflection in the visible region. Image enhancement software was used to extend the range where visual techniques could be used. In addition, the operation of a laser range finder, which operated at 0.835 microns, was tested when fog/water droplets were suspended in the air. The acoustic technique involved using commercial acoustic sensors, operating at approximately 50 kHz and 215 kHz, to determine the attenuation of the acoustic beam in a high-humidity environment. The radar imaging methods involved performing millimeter wave (94 GHz) attenuation measurement in the various simulated sluicing environments and performing preliminary experimental imaging studies using a W-Band (75–110 GHz) linearly scanned transceiver in a laboratory environment. The results of the tests are discussed.

2530 (PNL-10053) Environmental consequences to water resources from alternatives of managing spent nuclear fuel at Hanford. Whelan, G.; McDonald, J.P.; Sato, C. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003799. Source: OSTI; NTIS; INIS; GPO Dep.

With an environmental restoration and waste management program, the U.S. Department of Energy (DOE) is involved in developing policies pertinent to the transport, storage, and management of spent nuclear fuel (SNF). The DOE Environmental Impact Statement (EIS) for Programmatic SNF management is documented in a Volume 1 report, which contains an assessment of the Hanford installation, among others. Because the Hanford installation contains approximately 80% of the SNF associated with the DOE complex, it has been included in the decision for the ultimate disposition of the fuel. The Pacific Northwest Laboratory performed a series of assessments on five alternatives at Hanford for managing the SNF: No-Action, Decentralization, 1992/1993 Planning Basis, Regionalization, and Centralization. The environmental consequences associated with implementing these assessment alternatives potentially impact socioeconomic conditions; environmental quality of the air, groundwater, surface water, and surface soil; ecological, cultural, and geological resources; and land-use considerations. The purpose of this report is to support

the Programmatic SNF-EIS by investigating the environmental impacts associated with water quality and related consequences, as they apply to the five assessment alternatives at the Hanford installation. The results of these scenarios are discussed and documented.

2531 (PNL-10061) Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993. Sula, M.J.; Jette, S.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002582. Source: OSTI; NTIS; INIS; GPO Dep.

Assessments for evaluating compliance with airborne radionuclide emission monitoring requirements in the National Emission Standards for Hazardous Air Pollutants (NE-SHAPs - U.S. Code of Federal Regulations, Title 40 Part 61, Subparts H and I) were performed for 33 buildings at the U.S. Department of Energy's (DOE) Pacific Northwest Laboratory on the Hanford Site, and for five buildings owned and operated by Battelle, Pacific Northwest Laboratories in Richland, Washington. The assessments were performed using building radionuclide inventory data obtained in 1992 and 1993. Results of the assessments are summarized in Table S.1 for DOE-PNL buildings and in Table S.2 for Battelle-owned buildings. Based on the radionuclide inventory assessments, four DOE-PNL buildings (one with two emission points) require continuous sampling for radionuclides per 40 CFR 61. None of the Battelle-owned buildings require continuous emission sampling.

2532 (PNL-10126) Ferrocyanide safety project task 3 ferrocyanide aging studies FY 1994 annual report. Liiga, M.A.; Alderson, E.V.; Kowalski, D.J.; Lumetta, M.R.; Schiefelbein, G.F. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003800. Source: OSTI; NTIS; INIS; GPO Dep.

The research performed for this project is part of an effort begun in the mid-1980s to characterize the materials stored in the single-shell waste storage tanks (SSTs) at the U.S. Department of Energy (DOE) Hanford Site. Various radioactive wastes from defense operations have accumulated at the Hanford Site in underground waste tanks since the early 1940s. The goal of the Aging Studies task is to understand the long-term chemical and radiolytic behavior of ferrocyanide tank wastes in the SST environments. In turn, this information provides baseline data that will be useful as actual SST samples are obtained and analyzed. The results of aging studies will directly assist in determining which strategy will assure safe storage of the ferrocyanide waste in the tanks and how the ferrocyanide safety issue can be resolved. This report contains the results of FY 1994 research for the Aging Studies task, which focused on the hydrolysis of ferrocyanide waste simulants in aqueous base. Hydrolysis was investigated in 2M NaOH as a function of temperature, applied gamma dose rate, and soluble $\text{Fe}(\text{CN})_6^{4-}$ concentration. A hydrolysis experiment was conducted at pH 10 and another in the presence of aluminum. In addition, experiments investigating cesium ion exchange in competition with sodium nickel ferrocyanide dissolution were conducted.

2533 (PNL-10137-Rev.1) Water content of dried INFARM2 top simulant. Letter report, Revision 1. Bredt, P.R.; Scheele, R.D. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 29p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001160. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory received six simulated ferro-cyanide sludge samples, INFARM2 top (INFARM2-REV-17), from the Plutonium Process Support Laboratory (PPSL) in mid 1993 for analysis of water content by Thermogravimetric Analysis (TGA) coupled to Fourier Transform Infrared (FTIR) for identification of the thermally evolved gases. The samples were dried by the PPSL prior to delivery according to three methods listed below. Two samples were provided for each drying method, samples 1-6. One additional sample prepared using drying method 3 was received in May of 1994 to check for possible reabsorption of water during storage, sample 7. The light green samples, sealed in clear glass screw cap vials, appeared uniform in color.

2534 (PNL-10191) Product consistency testing of West Valley Compositional Variation Glasses. Olson, K.M.; Marschman, S.C.; Piepel, G.F.; Whiting, G.K. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004246. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear waste glass produced by the West Valley Demonstration Project (WVDP) must meet the requirements of the Waste Acceptance Preliminary Specification (WAPS) as developed by the US Department of Energy (DOE). To assist WVDP in complying with WAPS, the Materials Characterization Center (MCC) at Pacific Northwest Laboratory (PNL) used the Product Consistency Test (PCT) to evaluate 44 West Valley glasses that had previously been tested in FY 1987 and FY 1988. This report summarizes the results of the PCTs. The glasses tested, which were fabricated as sets of Compositional Variation Glasses for studies performed by the West Valley Support Task (WVST) at PNL during FY 1987 and FY 1988, were doped with Th and U and were variations of West Valley reference glasses. In addition, Approved Reference Material-1 (ARM-1) was used as a test standard (ARM-1 is supplied by the MCC). The PCT was originated at Westinghouse Savannah River Company (WSRC) by C. M. Jantzen and N. R. Bibler (Jantzen and Bibler 1989). The test is a seven-day modified MCC-3 test that uses crushed glass in the size range -100 +200 mesh with deionized water in a Teflon container. There is no agitation during the PCT, and no attempt to include CO₂ from the test environment. Based on B and Li release, the glasses performed about the same as in previous modified MCC-3 testing performed in FY 1987 and FY 1988 (Reimus et al. 1988). The modified MCC-3 tests performed by Reimus et al. were similar to the PCT containers and the exclusion of CO₂ from the tests.

2535 (PNL-10210) Characterization plan for Hanford spent nuclear fuel. Abrefah, J.; Thornton, T.A.; Thomas, L.E.; Berting, F.M.; Marschman, S.C. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005062. Source: OSTI; NTIS; INIS; GPO Dep.

Reprocessing of spent nuclear fuel (SNF) at the Hanford Site Plutonium-Uranium Extraction Plant (PUREX) was terminated in 1972. Since that time a significant quantity of N Reactor and Single-Pass Reactor SNF has been stored in the 100 Area K-East (KE) and K-West (KW) reactor basins. Approximately 80% of all US Department of Energy (DOE)-owned SNF resides at Hanford, the largest portion of which

is in the water-filled KE and KW reactor basins. The basins were not designed for long-term storage of the SNF and it has become a priority to move the SNF to a more suitable location. As part of the project plan, SNF inventories will be chemically and physically characterized to provide information that will be used to resolve safety and technical issues for development of an environmentally benign and efficient extended interim storage and final disposition strategy for this defense production-reactor SNF.

2536 (PNL-10281) Ecological Compliance Assessment Project: 1994 Summary report. Brandt, C.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004988. Source: OSTI; NTIS; INIS; GPO Dep.

The Ecological Compliance Assessment Project (ECAP) began full operation on March 1, 1994. The project is designed around a baseline environmental data concept that includes intensive biological field surveys of key areas of the Hanford Site where the majority of Site activities occur. These surveys are conducted at biologically appropriate times of year to ensure that the data gathered are current and accurate. The data are entered into the ECAP database, which serves as a reference for the evaluation of review requests coming in to the project. This methodology provided the basis for over 90 percent of the review requests received. Field surveys conducted under ECAP are performed to document occurrence information for species of concern and to obtain habitat descriptions. There are over 200 species of concern on the Hanford Site, including plants, birds, mammals, reptiles, amphibians, fish, and invertebrates. In addition, Washington State has designated mature sagebrush-steppe habitat as a Priority Habitat meriting special protective measures. Of the projects reviewed, 17 resulted or will result in impacts to species or habitats of concern on the Hanford Site. The greatest impact has been on big sagebrush habitat. Most of the impact has been or will be within the 600 Area of the Site.

2537 (PNL-10359-Vol.1) Property/composition relationships for Hanford high-level waste glasses melting at 115°C volume 1: Chapters 1-11. Hrma, P.R.; Piepel, G.F. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 344p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007952. Source: OSTI; NTIS; INIS; GPO Dep.

A Composition Variation study (CVS) is being performed within the Pacific Northwest Laboratory Vitrification Technology Development (PVTD) project in support of a future high-level nuclear waste vitrification plant at the Hanford site in Washington. From 1989 to 1994, over 120 nonradioactive glasses were melted and properties measured in five statistically-designed experimental phases. Glass composition is represented by the 10 components SiO₂, B₂O₃, Al₂O₃, Fe₂O₃, ZrO₂, Na₂O, Li₂O, CaO, MgO, and Others (all remaining components). The properties measured include viscosity (η), electrical conductivity (ϵ), glass transition temperature (T_g), thermal expansion of solid glass (α_s) and molten glass (α_m), crystallinity (quenched and canister centerline cooled glasses), liquidus temperature (T_L), durability based on normalized elemental releases from the Materials Characterization Center-1 28-day dissolution test (MCC-1, r_m) and the 7-day Product Consistency Test (PCT, r_{pi}), and solution pHs from MCC-1 and PCT. Amorphous phase separation was also evaluated. Empirical first- and second-order mixture models were fit using the CVS data to relate

the various properties to glass composition. Equations for calculating the uncertainty associated with property values predicted by the models were also developed. The models were validated using both internal and external data. Other modeling approaches (e.g., non-bridging oxygen, free energy of hydration, phase-equilibria T_L) were investigated for specific properties. A preliminary Qualified Composition Region was developed to identify glass compositions with high confidence of being processable in a melter and meeting waste form acceptance criteria.

2538 (PNL-10359-Vol.2) Property/composition relationships for Hanford high-level waste glasses melting at 1150°C volume 2: Chapters 12-16 and appendices A-K. Hrma, P.R.; Piepel, G.F. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 421p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007953. Source: OSTI; NTIS; INIS; GPO Dep.

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2539 (PNL-10398-Vol.1) K Basin spent fuel sludge treatment alternatives study. Volume 1, Regulatory options. Beary, M.M. (Science Applications International Corp., Richland, WA (United States)); Honekemp, J.R.; Winters, N. Pacific Northwest Lab., Richland, WA (United States); Science Applications International Corp., Richland, WA (United States). Jan 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Agreement 188694-A-A2. Order Number DE95006193. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 2100 metric tons of irradiated N Reactor fuel are stored in the KE and KW Basins at the Hanford Site, Richland, Washington. Corrosion of the fuel has led to the formation of sludges, both within the storage canisters and on the basin floors. Concern about the degraded condition of the fuel and the potential for leakage from the basins in proximity to the Columbia River has resulted in DOE's

commitment in the Tri-Party Agreement (TPA) to Milestone M-34-00-T08 to remove the fuel and sludges by a December 2002 target date. To support the planning for this expedited removal action, the implications of sludge management under various scenarios are examined. Volume 1 of this two-volume report describes the regulatory options for managing the sludges, including schedule and cost impacts, and assesses strategies for establishing a preferred path.

2540 (PNL-10398-Vol.2) K Basin spent fuel sludge treatment alternatives study. Volume 2, Technical options. Beary, M.M. (Science Applications International Corp., Richland, WA (United States)); Honekemp, J.R.; Winters, N. Pacific Northwest Lab., Richland, WA (United States); Science Applications International Corp., Richland, WA (United States). Jan 1995. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Agreement 188694-A-A2. Order Number DE95006194. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 2100 metric tons of irradiated N Reactor fuel are stored in the KE and KW Basins at the Hanford Site, Richland, Washington. Corrosion of the fuel has led to the formation of sludges, both within the storage canisters and on the basin floors. Concern about the degraded condition of the fuel and the potential for leakage from the basins in proximity to the Columbia River has resulted in DOE's commitment in the Tri-Party Agreement (TPA) to Milestone M-34-00-T08 to remove the fuel and sludges by a December 2002 target date. To support the planning for this expedited removal action, the implications of sludge management under various scenarios are examined. This report, Volume 2 of two volumes, describes the technical options for managing the sludges, including schedule and cost impacts, and assesses strategies for establishing a preferred path.

2541 (PNL-10497) Product consistency testing of three reference glasses in stainless steel and perfluoroalkoxy resin vessels. Olson, K.M.; Smith, G.L.; Marschman, S.C. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010324. Source: OSTI; NTIS; INIS; GPO Dep.

Because of their chemical durability, silicate glasses have been proposed and researched since the mid-1950s as a medium for incorporating high-level radioactive waste (HLW) generated from processing of nuclear materials. A number of different waste forms were evaluated and ranked in the early 1980s; durability (leach resistance) was the highest weighted factor. Borosilicate glass was rated the best waste form available for incorporation of HLW. Four different types of vessels and three different glasses were used to study the possible effect of vessel composition on durability test results from the Production Consistency Test (PCT). The vessels were 45-m 304 stainless steel vessels, 150-m 304 L stainless steel vessels, and 60-m perfluoroalkoxy (PFA) fluoropolymer resin vessels. The three glasses were the Environmental Assessment glass manufactured by Corning Incorporated and supplied by Westinghouse Savannah River company, and West Valley Nuclear Services reference glasses 5 and 6, manufactured and supplied by Catholic University of America. Within experimental error, no differences were found in durability test results using the 3 different glasses in the 304L stainless steel or PFA fluoropolymer resin vessels over the seven-day test period.

2542 (PNL-SA-23186) NEPA implementation: The Department of Energy's program to manage spent nuclear fuel. Shipler, D.B. Pacific Northwest Lab., Richland, WA (United States). May 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940553-70: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94014558. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is implementing the National Environmental Protection Act (NEPA) in its management of spent nuclear fuel. The DOE strategy is to address the short-term safety concerns about existing spent nuclear fuel, to study alternatives for interim storage, and to develop a long-range program to manage spent nuclear fuel. This paper discusses the NEPA process, the environmental impact statements for specific sites as well as the overall program, the inventory of DOE spent nuclear fuel, the alternatives for managing the fuel, and the schedule for implementing the program.

2543 (PNL-SA-23384) Towards optimization of nuclear waste glass: Constraints, property models, and waste loading. Hrma, P. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-21: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94015286. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification of both low- and high-level wastes from 177 tanks at Hanford poses a great challenge to glass makers, whose task is to formulate a system of glasses that are acceptable to the federal repository for disposal. The enormous quantity of the waste requires a glass product of the lowest possible volume. The incomplete knowledge of waste composition, its variability, and lack of an appropriate vitrification technology further complicates this difficult task. A simple relationship between the waste loading and the waste glass volume is presented and applied to the predominantly refractory (usually high-activity) and predominantly alkaline (usually low-activity) waste types. Three factors that limit waste loading are discussed, namely product acceptability, melter processing, and model validity. Glass formulation and optimization problems are identified and a broader approach to uncertainties is suggested.

2544 (PNL-SA-23386) Laboratory studies for estimation of melting rate in nuclear waste glass melters. Kim, D.S.; Hrma, P.R. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-28: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94019190. Source: OSTI; NTIS; INIS; GPO Dep.

In the slurry-fed, high-level waste glass melter, a porous crust of calcined slurry (cold cap) is formed. Currently, the melting behavior of the cold cap can only be tested by large-scale melter runs that take extensive planning, time, and cost. Thus, developing small-scale laboratory testing methods that will enable estimating the melting rate in the large-scale melter is highly desirable. Cold cap materials retrieved from current large-scale melter runs at Pacific Northwest Laboratory (PNL) have been examined. Based on the literature review and the study of the cold cap materials, the major processes that determine the cold cap melting

rate are identified and possible laboratory test methods to evaluate the pertinent processing properties are discussed.

2545 (PNL-SA-23453) Development of high-waste loaded high-level nuclear waste glasses for high-temperature melter. Kim, D.S.; Hrma, P.R.; Lamar, D.A.; Elliott, M.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-27: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94019191. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the approach taken in formulating glasses that can be processed at 1150 to 1500°C by applying glass property/composition models developed at Pacific Northwest Laboratory. Compositions and melting temperatures for glasses with high waste loading that are acceptable and able to be processed were determined for two different Hanford waste types. The glasses meet high-level waste glass acceptability criteria and are suitable for processing in a continuous Joule-heated melter.

2546 (PNL-SA-23454) Maximization of waste loading for a vitrified Hanford high-activity simulated waste. Fini, P.T. (State Univ. of New York, Alfred, NY (United States). Coll. of Ceramics); Hrma, P. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-23: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94015273. Source: OSTI; NTIS; INIS; GPO Dep.

Simulated high-level nuclear waste glasses incorporating up to 70 wt % Neutralized Current Acid Waste (NCAW) were prepared. For the waste loading (W) range of 40 to 55 wt %, alkali-borosilicate glasses were formulated with a melting temperature of 1,150 C; for W > 55 wt %, only silica was added to the waste and the melting temperature was 1,150 C. Properties measured included durability and crystallinity of slowly cooled glasses and glasses heat treated for 24 hours at 1,050 C. Acceptable durability (by the Environmental Assessment glass standard) was retained up to W = 70 wt %, which is the maximum NCAW waste loading if no limit on crystallinity is imposed. If < 1 vol% of spinel is acceptable in the melt at 1,050 C, a waste loading of approximately 50 wt % is possible. If no crystallinity is permissible at 1,050 C, W = 34 wt % is the estimated maximum.

2547 (PNL-SA-23487) The role of frit in nuclear waste vitrification. Vienna, J.D.; Smith, P.A.; Dorn, D.A.; Hrma, P. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-22: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94015212. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification of nuclear waste requires additives which are often vitrified independently to form a frit. Frit composition is formulated to meet the needs of glass composition and processing. The effects of frit on melter feed and melt processing, glass acceptance, and waste loading is of practical interest in understanding the trade-offs associated with the competing demands placed on frit composition. Melter feed yield stress, viscosity and durability of frits and corresponding waste glasses as well as the kinetics of elementary

melting processes have been measured. The results illustrate the competing requirements on frit. Four frits (FY91, FY93, HW39-4, and SR202) and simulated neutralized current acid waste (NCAW) were used in this study. The experimental evidence shows that optimization of frit for one processing related property often results in poorer performance for the remaining properties. The difficulties associated with maximum waste loading and durability are elucidated for glasses which could be processed using technology available for the previously proposed Hanford Waste Vitrification Plant.

2548 (PNL-SA-23488) Predicting liquid immiscibility in multicomponent nuclear waste glasses. Peeler, D.K.; Hrma, P.R. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-17: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94014571. Source: OSTI; NTIS; INIS; GPO Dep.

Taylor's model for predicting amorphous phase separation in complex, multicomponent systems has been applied to high-level (simulated) radioactive waste glasses at the US Department of Energy's Hanford site. Taylor's model is primarily based on additions of modifying cations to a $\text{Na}_2\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$ (NBS) submixture of the multicomponent glass. The position of the submixture relative to the miscibility dome defines the development probability of amorphous phase separation. Although prediction of amorphous phase separation in Hanford glasses (via experimental SEM/TEM analysis) is the primary thrust of this work; reported durability data is also provides limited insight into the composition/durability relationship. Using a modified model similar to Taylor's, the results indicate that immiscibility may be predicted for multicomponent waste glasses by the addition of Li_2O to the "alkali" corner of the NBS submixture.

2549 (PNL-SA-23718) Comparative study of Total Organic Carbon (TOC) methods for high-level mixed waste. Baldwin, D.L. (Pacific Northwest Lab., Richland, WA (United States)); Stromatt, R.W.; Winters, W.I. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-104: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95004900. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford tank waste is a complex, nonhomogeneous sludge, slurry, or salt-cake mixture requiring robust methods for analytical characterization. While numerous total organic carbon (TOC) methods are described in the literature, no single TOC method has been found to be ideal for this caustic, high-salt, sometime high-fluoride matrix. Three TOC methods have been in use at the Pacific Northwest Laboratory, and one complementary method is in place at Westinghouse Hanford Company. All have been found to have strengths and weaknesses when applied to the Hanford tank waste problem. These TOC methods include silver-catalyzed hot persulfate wet oxidation in batch-mode with coulometry detection, two methods for high-temperature furnace oxidation with coulometry detection, and UV-catalyzed persulfate oxidation with nondispersive infrared detection. To provide comparative data on these four methods, a recovery study of carbon compounds, which are relevant to Hanford tank waste, has been performed. One

major conclusion is that it is most useful to have multiple methods available for the analysis of this waste material. The comparative study is discussed, operational experience in TOC analysis from these laboratories is described, and strengths and weaknesses in the methods are summarized.

2550 (PNL-SA-23723) Salt splitting of sodium-dominated radioactive waste using ceramic membranes. Hollenberg, G.W. (Pacific Northwest Lab., Richland, WA (United States)); Carlson, C.D.; Virkar, A.; Joshi, A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-103: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95004578. Source: OSTI; NTIS; INIS; GPO Dep.

The potential for salt splitting of sodium dominated radioactive wastes by use of a ceramic membrane is reviewed. The technical basis for considering this processing technology is derived from the technology developed for battery and chlor-alkali chemical industry. Specific comparisons are made with the commercial organic membranes which are the standard in nonradioactive salt splitting. Two features of ceramic membranes are expected to be especially attractive: high tolerance to gamma irradiation and high selectivity between sodium and other ions. The objective of the salt splitting process is to separate nonradioactive sodium from contaminated sodium salts prior to other pre-treatment processes in order to: (1) concentrate the waste in order to reduce the volume of subsequent additives and capacity of equipment, (2) decrease the pH of the waste in preparation for further processing, and (3) provide sodium with very low radioactivity levels for caustic washing of sludge or low level and mixed waste vitrification.

2551 (PNL-SA-24034) Progress toward maturity of DOE methods for evaluating environmental and waste management samples. Cosby, W.C. (ed.) (and others); Goheen, S.C.; McCulloch, M. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940790-2: 10. annual waste testing and quality assurance symposium, Arlington, VA (United States), 11-15 Jul 1994). Order Number DE94015944. Source: OSTI; NTIS; INIS; GPO Dep.

The document DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods) has been in circulation since October 1992. DOE Methods is a living document, being updated twice each year. It contains both sampling and analytical methods in support of US Department of Energy/environmental restoration and waste management (DOE/EM) activities. Guidance on how to carry out sampling and analysis activities, focusing of EM needs, is also included in DOE Methods. This guidance applies to all aspects of sampling and analysis for EM. Methods from traditional standard methods documents often cannot provide needed characterization data because of radioactivity or complexity of the matrix. The intent of DOE Methods is to provide an alternative source of methods to meet this need. Efforts are underway to expand the use of DOE Methods throughout all DOE/EM programs. Copies of DOE Methods are available free of charge. The April 1994 update of the document includes 42 methods, of which 13 are new. In October 1994, Revision 2 of DOE Methods will be distributed. It will include additional guidance on how to plan sampling and analysis activities and will also include several new.

methods. DOE Methods is supported by the Laboratory Management Division of DOE. It is a vehicle for transgressing new technology for characterization capability within the environmental restoration (ER) and/or waste management (WM) community. As DOE Methods continues to evolve, its use and application will continue to grow.

2552 (PNL-SA-24079) Gas generation by corrosion of Cu- and Ti-base materials in simulated waste isolation pilot plant environments. Westerman, R.E.; Telander, M.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409178-11: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95003148. Source: OSTI; NTIS; INIS; GPO Dep.

A mined geologic repository for demonstrating the safe management and disposal of defense-related transuranic (TRU) waste is being developed by the U.S. Department of Energy near Carlsbad, New Mexico. The site, designated the Waste Isolation Pilot Plant (WIPP), is located in the bedded salt of the Salado Formation, at a depth of 655 m (2150 ft) below the land surface. Eight storage panels of seven rooms each will be mined. The panels, access ways, and shafts will be sealed before the site is decommissioned. At the present time, a large quantity of transuranic wastes are being, temporarily, stored in steel drums and steel waste boxes at waste generator sites. Under current plans, these wastes would be transported to and emplaced within the WIPP site, without additional modification of the original packaging. Additional metal articles (Fe- and Al-based alloys, for example) are contained within the waste containers as contaminated waste materials. Butcher describes several potentially negative effects of highly pressurized gas on the WIPP site. It will tend to retard room closure; it could contribute to fractures within the disturbed rock zone; it has the potential of leaking from the site, possibly causing perceptual, technical, or regulatory concerns; it can contribute to two-phase gas-driven flow from the repository; and it could possibly degrade the repository sealing system. The site-prepressurization concerns led to selecting of alternative container materials. Of the metallic container materials considered, copper-base and titanium-base alloys were judged to offer the best combination of properties when fabricability, availability, technology status, cost, and gas-generation potential were taken into account.

2553 (PNL-SA-24110) Predicting environmental restoration activities through static simulation. Ross, T.L.; King, D.A.; Wilkins, M.L.; Forward, M.F. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941256-1: Winter simulation conference, Orlando, FL (United States), 11-14 Dec 1994). Order Number DE95007166. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses a static simulation model that predicts several performance measures of environmental restoration activities over different remedial strategies. Basic model operation consists of manipulating and processing waste streams via selecting and applying remedial technologies according to the strategy. Performance measure prediction is possible for contaminated soil, solid waste, surface water, groundwater, storage tank, and facility sites.

Simulations are performed for the U.S. Department of Energy in support of its Programmatic Environmental Impact Statement.

2554 (PNL-SA-24139) Effects of Pd, Rh, and Ru concentration on HCOOH decomposition during the processing of NCAW waste simulant. Patello, G.K.; Smith, H.D.; Wiemers, K.D.; Williford, R.E.; Bell, R.D.; Larson, D.E. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940416-11: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94013324. Source: OSTI; NTIS; INIS; GPO Dep.

The noble metals Pd, Rh, and Ru that are present in the Hanford high-level waste will be processed into a melter feed for vitrification and permanent disposal. The treatment of waste slurry with HCOOH, a step in producing a melter feed, results in the production of H₂ and NH₃ due to the catalytic activity of the noble metals. The presence of H₂ and NH₃ could lead to hazardous conditions in a treatment facility. This study determined the relationship between noble metals concentration and H₂ and NH₃ production for application in future pilot-scale studies and prediction of catalytic activity for a waste with known noble metals concentration. Hydrogen production increased as noble metals concentration increased until a saturation level was reached. Ammonia production increased with noble metal concentration. Due to the limited number of tests, these relationships require confirmation.

2555 (PNL-SA-24144) Survey speeds to detect one times and three times total contamination values from U.S. Department of Energy Radiological Control Manual, Table 2-2. Johnson, M.L. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941017-5: 4. conference on radiation protection and dosimetry, Orlando, FL (United States), 24-27 Oct 1994). Order Number DE95004564. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents maximum scan speeds to maintain the minimum detectable activity (MDA) of Hanford contamination survey instruments at one times or three times the total contamination value. Scan speeds are interpolated from empirically derived minimum detectable count rates (MDCR) for beta/gamma and alpha contamination survey instruments. The MDCRs were measured using distributed contamination sources. The instruments tested were a 15.5-cm² pancake Geiger-Mueller (GM) detector, a 100-cm² gas proportional detector, and a 50-cm² Hanford portable alpha meter (PAM). The MDCR for a scanning survey is highly dependent on survey technique. Scanning surveys at Hanford are performed by scanning the surface with the probe held a maximum of 6 mm (1/4 in.) away from the surface. If an increase above background is noted, the technician pauses for 5 to 10 seconds. For this evaluation, any counts detected with an alpha survey instrument are treated as an increase above background (assumed to be 0 cpm). During the 5- to 10-second count, if additional counts are detected, the area is assumed to be contaminated. Methods for calculating the MDA were previously developed and reported in Goles et al. (1991). This report also provides MDAs for a 5-second static count with 67% and 95% probability of detection. The 5-second static count is conducted with the probe in contact with the surface being surveyed. The 67%

detection probability is based on a Draft ANSI Standard N13.12 (ANSI 1978). The 95% detection probability is based on typical confidence levels used with fixed sample-counting instruments.

2556 (PNL-SA-24319) RCRA permitting strategies for innovative technologies demonstrations. Donaghue, J.F.; Gajewski, S.W. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-100: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94019104. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) Hanford Site's huge waste inventory and environmental contamination are the result of almost 50 years of weapons plutonium production. The research, development, and demonstration (RD&D) of innovative cleanup technologies are crucial to Hanford cleanup. RD&D activities involving hazardous and mixed waste are subject to Resource Conservation and Recovery Act (RCRA) regulations. RD&D activities are dynamic and unpredictable, and do not fit well with the RCRA permitting process, which was developed for stable commercial activities. The lengthy, highly detailed process for acquiring and modifying RCRA permits is a major barrier to the development and implementation of innovative waste treatment technologies. The challenge at Hanford is to find more flexible regulatory mechanisms to support critical RD&D activities and to work effectively with regulators to provide the regulatory logic, technical familiarity, trust, and confidence necessary to support technology development requirements. The team analyzed RCRA permitting alternatives, and surveyed more than 50 RD&D activities, assigning each a tentative compliance pathway based on an optimum interpretation of the alternatives. The results were delivered to the regulators, along with specific recommendations regarding regulatory interpretations and strategies that would support an aggressive RD&D program without compromising public health and safety.

2557 (PNL-SA-24739) Optical fiber smart structures applied to secure containers. Sliva, P.; Gordon, N.R.; Stahl, K.A.; Simmon, K.L.; Anheier, N.C. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940748-83: 35. annual meeting of the Institute of Nuclear Materials Management (INMM), Naples, FL (United States), 17-20 Jul 1994). Order Number DE94017478. Source: OSTI; NTIS; GPO Dep.

A prototype secure container was prepared that uses continually monitored optical fiber as the smart structure. A small (≈ 7.6 cm $\times$ 10.2 cm $\times$ 12.7 cm), matchbox-shaped container consisting of an inner drawer within an outer shell was fabricated from polymer resin. The optical fiber was sandwiched between additional non-optical, strength-promoting fibers and embedded into the polymer. The additional non-optical fiber provides strength to the container, protects the optical fiber from damage, hides the fiber and acts as a decoy. The optical fiber was wound with a winding density such that a high probability of fiber damage would be expected if the container was penetrated.

2558 (PNL-SA-24790) Models for liquidus temperature of nuclear waste glasses. Kim, D.S.; Hama, P.R. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 12p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-76RL01830. (CONF-940416-29: 96. annual meeting of the American Ceramic Society (ACS), Indianapolis, IN (United States), 25-28 Apr 1994). Order Number DE94019192. Source: OSTI; NTIS; INIS; GPO Dep.

The liquidus temperature (T_L) was measured for simulated glasses from Hanford high-level nuclear waste composition range. The data were compared with three different prediction methods: (1) multicomponent crystallinity constraints (used to identify compositions with $T_L > 1050^\circ\text{C}$); (2) thermodynamic T_L models based on phase equilibria (developed by The Centre for Research in Computational Thermochemistry, Ecole Polytechnique, Montreal, Quebec, Canada); and (3) the Savannah River Site (SRS) model based on the free energy of formation of the crystalline phase. First-order T_L models were developed for crystalline phases that precipitated in a sufficient number of glasses.

2559 (PNL-SA-24970) A systems engineering analysis to examine the economic impact for treatment of tritiated water in the Hanford KE-Basin. Villegas, A.; Clark, L.; Schmidt, A. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-81: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008960. Source: OSTI; NTIS; INIS; GPO Dep.

Federal and state agencies have established a Tri-Party Agreement (TPA) to address some key environmental issues faced at the Hanford Site. Under the TPA, the Department of Energy is currently under a consent order to reduce the tritium concentration in the spent fuel storage basin for KE-Reactor from 3.0 $\mu\text{Ci/L}$ to 0.3 $\mu\text{Ci/L}$ in the KE spent fuel storage basin, starting in 1996. The 100KE and 100KW Area fuel storage basins (K-Basins) at Hanford were built in the early 1950s to receive and provide temporary storage for irradiated fuel from the now shutdown KE and KW production reactors. In 1977, the KE-Basin began to leak at a rate of 13.5 gpm (51 L/min.), but, decreased to 0.03 to 0.05 gpm (0.13 to 0.19 L/min.) by 1980. In 1993, the leak increased to a rate of 0.42 gpm (1.6 L/min.). This engineering analysis examines the relative costs to reduce the tritium concentration KE-Basin water using a polyphosphazene polymer membrane under development at Pacific Northwest Laboratory. The estimated cost of using the membrane to reduce the tritium concentration is compared to three no-treatment alternatives that include: (1) disposing of the tritium-contaminated water directly to the Columbia River, (2) disposing of the contaminated water to the soil at the on-site Effluent Treatment Facility, and (3) disposing of the contaminated water by evaporation using solar evaporation ponds.

2560 (PNL-SA-25177) Stabilization of reactor fuel storage pool-TTP. Sevigny, G. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9410307-1: Facility transitioning, decommissioning and final disposition focus area briefing, Knoxville, TN (United States), 24-25 Oct 1994). Order Number DE95005400. Source: OSTI; NTIS; INIS; GPO Dep.

TTP/RL352002.

The proposed work includes evaluating standard and improved technologies and designing an integrated demonstration system to clean the water and sludge the fuel storage pools. The water released would meet drinking water standards and tritium standards. The volume of radioactive sludge would be reduced by partial separation of

the sludge and radionuclides and eventual solidification of the hazardous and radioactive waste. The scope of the work includes a survey of needs and applicable technologies, system engineering evaluation, conceptual design, detailed design, fabrication of the integrated demonstration system, and testing of the system. The survey task will locate potential specific customers within the DOE complex, and outside of the DOE complex throughout the United States, that be able to utilize the narrowly focused technology to stabilize/shutdown reactor fuel storage pools, responsible parties will be located and asked to respond to a survey about their specific process requirements. Literature searches will be run through technical and scientific databases to locate technologies that may be an improvement over the standard baselined technology for cleanup of radioactively-contaminated pools. Systems engineering will provide decision analysis support for the development, evaluation, design, test functions of the treatment of pool water and sludge.

2561 (SAND-93-0808) Results of brine flow testing and disassembly of a crushed salt/bentonite block seal at the Waste Isolation Pilot Plant. Finley, R.E. (Sandia National Labs., Albuquerque, NM (United States)); Jones, R.L. (Sandia National Labs., Albuquerque, NM (United States)). Mar 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94010660. Source: OSTI; NTIS; INIS; GPO Dep.

The Small-Scale Seal Performance Tests, Series C, a set of in situ experiments conducted at the Waste Isolation Pilot Plant, are designed to evaluate the performance of various seal materials emplaced in large (0.9-m-diameter) boreholes. This report documents the results of fluid (brine) flow testing and water and clay content analyses performed on one emplaced seal comprised of 100% salt blocks and 50%/50% crushed salt/bentonite blocks and disassembled after nearly three years of brine injection testing. Results from the water content analyses of 212 samples taken from within this seal show uniform water content throughout the 50%/50% salt/bentonite blocks with saturations about 100%. Clay content analyses from the 100% salt endcaps of the seal show a background clay content of about 1% by weight uniformly distributed, with the exception of samples taken at the base of the seal at the borehole wall interface. These samples show clay contents up to 3% by weight, which suggests some bentonite may have migrated under pressure to that interface. Results of the brine-flow testing show that the permeability to brine for this seal was about 2 to 3×10^{-4} darcy (2 to 3×10^{-16} m²).

2562 (SAND-93-2441) Considerations for guidance for radioactive waste disposal arising from rules under 40 CFR 191 and 40 CFR 194. Trauth, K.M. (Sandia National Labs., Albuquerque, NM (United States)); Bertram, S.G.; Bower, B. (Sandia National Labs., Albuquerque, NM (United States)). Sep 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001413. Source: OSTI; NTIS; GPO Dep.

Preliminary performance assessments have been conducted for the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico. These analyses assess the ability of the WIPP, a proposed disposal facility for defense-generated nuclear waste, to comply with the Environmental Protection Agency's (EPA's) requirements at 40 CFR 191. With the passage of the WIPP Land Withdrawal Act in 1992, the EPA is required to develop WIPP-specific criteria (to be found at 40 CFR 194) by which the EPA will certify whether or not the WIPP complies with 40 CFR 191. The preliminary

performance assessments, including expert judgment panels on future societies and passive institutional controls, are a useful source of information that can be used to guide the EPA in its development of the criteria. Three areas that would benefit from consideration by the EPA are future states, passive institutional controls, and groundwater requirements.

2563 (SAND-93-2450) A formal expert judgment procedure for performance assessments of the Waste Isolation Pilot Plant. Trauth, K.M. (Sandia National Labs., Albuquerque, NM (United States)); Guzowski, R.V.; Hora, S.C. (Sandia National Labs., Albuquerque, NM (United States)). Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001113. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is an experimental facility located in southeastern New Mexico. It has been designed to determine the feasibility of the geologic disposal of defense-generated transuranic waste in a deep bedded-salt formation. The WIPP was also designed for disposal and will operate in that capacity if approved. The WIPP Performance Assessment Department at Sandia National Laboratories has been conducting analyses to assess the long-term performance of the WIPP. These analyses sometimes require the use of expert judgment. This Department has convened several expert-judgment panels and from that experience has developed an internal quality-assurance procedure to guide the formal elicitation of expert judgment. This protocol is based on the principles found in the decision-analysis literature.

2564 (SAND-93-7058) Hydrostatic and shear consolidation tests with permeability measurements on Waste Isolation Pilot Plant crushed salt. Brodsky, N.S. (RE/SPEC, Inc., Rapid City, SD (United States)). Sandia National Labs., Albuquerque, NM (United States); RE/SPEC, Inc., Rapid City, SD (United States). Mar 1994. 227p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94009980. Source: OSTI; NTIS; INIS; GPO Dep.

Crushed natural rock salt is a primary candidate for use as backfill and barrier material at the Waste Isolation Pilot Plant (WIPP) and therefore Sandia National Laboratories (SNL) has been pursuing a laboratory program designed to quantify its consolidation properties and permeability. Variables that influence consolidation rate that have been examined include stress state and moisture content. The experimental results presented in this report complement existing studies and work in progress conducted by SNL. The experiments described in this report were designed to (1) measure permeabilities of consolidated specimens of crushed salt, (2) determine the influence of brine saturation on consolidation under hydrostatic loads, and (3) measure the effects of small applied shear stresses on consolidation properties. The laboratory effort consisted of 18 individual tests: three permeability tests conducted on specimens that had been consolidated at Sandia, six hydrostatic consolidation and permeability tests conducted on specimens of brine-saturated crushed WIPP salt, and nine shear consolidation and permeability tests performed on crushed WIPP salt specimens containing 3 percent brine by weight. For hydrostatic consolidation tests, pressures ranged from 1.72 MPa to 6.90 MPa. For the shear consolidation tests, confining pressures were between 3.45 MPa and 6.90 MPa and applied axial stress differences were between 0.69 and 4.14 MPa. All tests were run under drained conditions at 25°C.

2565 (SAND-93-7066) Salado mass concrete: Mixture development and preliminary characterization. Wakeley, L.D. (Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). Structures Lab.); Ernzen, J.J.; Neeley, B.D.; Hansen, F.D. Sandia National Labs., Albuquerque, NM (United States). Jun 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94015530. Source: OSTI; NTIS; GPO Dep.

A salt-saturated concrete proportioned with Class H oil-well cement, Class F fly ash, and a shrinkage compensating component was developed to meet performance requirements for mass placement as seal components at the Waste Isolation Pilot Plant. Target properties of the concrete included 8-in. slump 3 hr after mixing, no aggregate segregation, heat rise of $< 25^{\circ}\text{F}$ 4 hr after mixing, compressive strength of 4,500 psi at 180 days, minimal volume change, and probable geochemical stability for repository conditions. Thermal and mechanical properties of promising candidate concrete mixtures were measured. Modulus of elasticity and creep behavior were similar to those of ordinary portland cement mass concretes. Thermal expansion for the salt-saturated concrete developed here was typical of ordinary concrete with similar silicate aggregates. Thermal conductivity, diffusivity, and specific heat approximated values measured for other mass concretes and were similar to values of the host salt rock.

2566 (SAND-94-0482) Scenario development for the Waste Isolation Pilot Plant: Building confidence in the assessment. Galson, D.A.; Swift, P.N. Sandia National Labs., Albuquerque, NM (United States). Jul 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94017291. Source: OSTI; NTIS; INIS; GPO Dep.

Scenario development is part of the iterative performance assessment (PA) process for the Waste Isolation Pilot Plant (WIPP). Scenario development for the WIPP has been the subject of intense external review and is certain to be the subject of continued scrutiny as the project proceeds toward regulatory compliance. The principal means of increasing confidence in this aspect of the PA will be through the use of the systematic and thorough procedure toward developing the scenarios and conceptual models on which the assessment is to be based. Early and ongoing interaction with project reviewers can assist with confidence building. Quality of argument and clarity of presentation in PA will be of key concern. Appropriate tools are required for documenting and tracking assumptions, through a single assessment phase, and between iterative assessment phases. Risks associated with future human actions are of particular concern to the WIPP project, and international consensus on the principles for incorporation of future human actions in assessments would be valuable.

2567 (SAND-94-0482C) Scenario development for the Waste Isolation Pilot Plant: Building confidence in the assessment. Galson, D.A. (Galson Sciences Limited, (United Kingdom)); Swift, P.N. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940553-16: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94007933. Source: OSTI; NTIS; INIS; GPO Dep.

Scenario developments is part of the iterative performance assessment (PA) process for the Waste Isolation

Pilot Plant (WIPP). Scenario development for the WIPP has been the subject of intense external review, and is certain to be the subject of continued scrutiny as the project proceeds toward regulatory compliance. The principal means of increasing confidence in this aspect of the PA will be through the use of a systematic and thorough procedure toward developing the scenarios and conceptual models on which the assessment is to be based. Early and ongoing interaction with project reviewers can assist with confidence building. Quality of argument and clarity of presentation in PA will be of key concern. Appropriate tools are required for documenting and tracking assumptions, through a single assessment phase, and between iterative assessment phases. Risks associated with future human actions are of particular concern to the WIPP project, and international consensus on the principles for incorporation of future human actions in assessments would be valuable.

2568 (SAND-94-0599C) Integrated modeling and experimental programs to predict brine and gas flow at the Waste Isolation Pilot Plant. Beauheim, R.L.; Howarth, S.M.; Vaughn, P.; Webb, S.W.; Larson, K.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941053-1: International symposium on validation through model testing with experiments, Paris (France), 11-14 Oct 1994). Order Number DE95005425. Source: OSTI; NTIS; INIS; GPO Dep.

Evaluation of the performance of the WIPP repository involves modeling of brine and gas flow in the host rocks of the Salado Formation, which consist of halite and anhydrite interbeds. Numerous physical, chemical, and structural processes, must be understood to perform this modeling. Gas generation within the repository is strongly coupled to the amount of brine inflow to the repository because brine aids in the corrosion of metals and associated generation of hydrogen gas. Increasing gas pressure in the repository decreases the rate of brine inflow. Ultimately, the gas pressure may exceed the brine pressure and gas may flow out of the repository. Relative-permeability curves and a correlation between threshold pressure and permeability taken from studies reported in the literature were used in PA models prior to being experimentally verified as appropriate for WIPP. In addition, interbed permeabilities were treated as constant and independent of effective stress in early models. Subsequently, the process of interbed fracturing (or fracture dilation) was recognized to limit gas pressures in the repository to values below lithostatic, and assumed (and unverified) relationships between porosity, permeability, and pore pressure were employed. Parameter-sensitivity studies performed using the simplified models identified important parameters for which site-specific data were needed. Unrealistic modeling results, such as room pressures substantially above lithostatic, showed the need to include additional processes in the models. Field and laboratory experimental programs have been initiated in conjunction with continued model development to provide information on important processes and parameters.

2569 (SAND-94-0764C) The Assessment of Future Human Actions at Radioactive Waste Disposal Sites: An international perspective. Anderson, D.R. (Sandia National Labs., Albuquerque, NM (United States)); Galson, D.A.; Patera, E.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940553-19: International high-level

radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94008923. Source: OSTI; NTIS; INIS; GPO Dep.

For some deep geological disposal systems, the level of confinement provided by the natural and engineered barriers is considered to be so high that the greatest long-term risks associated with waste disposal may arise from the possibility of future human actions breaching the natural and/or engineered barrier systems. Following a Workshop in 1989, the OECD Nuclear Energy Agency established a Working Group on Assessment of Future Human Actions (FHA) a Radioactive Waste Disposal Sites. This Group met four times in the period 1991-1993, and has extensively reviewed approaches to and experience of incorporating the effects of FHA into long-term performance assessments (PAs). The Working Group's report reviews the main issues concerning the treatment of FHA, presents a general framework for the quantitative, consideration of FHA in radioactive waste disposal programmes, and discusses means in reduce the risks associated with FHA. The Working Group concluded that FHA must be considered in PAs, although FHA where the actors were cognizant of the risks could be ignored. Credit can be taken for no more than several hundred years of active site control; additional efforts should therefore be taken to reduce the risks associated with FHA. International agreement on principles for the construction of FHA scenarios would build confidence, as would further discussion concerning regulatory policies for judging risks associated with FHA.

2570 (SAND-94-1070C) Hydrologic studies for the Waste Isolation Pilot Plant. Davies, P.B. Sandia National Labs., Albuquerque, NM (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409162-1: Annual New Mexico water conference, Carlsbad, NM (United States), 30 Sep - 1 Oct 1994). Order Number DE94014283. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper is to provide a general overview of hydrologic conditions at the Waste Isolation Pilot Plant (WIPP) by describing several key hydrologic studies that have been carried out as part of the site characterization program over the last 20 years. The paper is composed of three parts: background information about general objectives of the WIPP project; information about the geologic and hydrologic setting of the facility; and information about three aspects of the hydrologic system that are important to understanding the long-term performance of the WIPP facility. For additional detailed information, the reader is referred to the references cited in the text.

2571 (SAND-94-1145C) Development of a gas-generation model for the Waste Isolation Pilot Plant. Brush, L.H. (Sandia National Labs., Albuquerque, NM (United States)); Storz, L.J.; Garner, J.W. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931195-4: International symposium on scientific basis for nuclear waste management, Boston, MA (United States), 29 Nov - 3 Dec 1993). Order Number DE94010756. Source: OSTI; NTIS; INIS; GPO Dep.

Design-basis transuranic (TRU) waste to be emplaced in the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico may generate significant quantities of gas, which may affect the performance of the WIPP with respect to regulations for radioactive and/or chemically hazardous waste

constituents. We are developing a model to predict gas generation in WIPP disposal rooms during and after filling and sealing. Currently, the model includes: (1) oxic and anoxic corrosion of steels and other Fe-base alloys, including passivation and depassivation; (2) microbial degradation of cellulose with O_2 , NO_3^- , $FeO(OH)$, SO_4^{2-} , or CO_2 as the electron acceptor; (3) α radiolysis of brine; (4) consumption of CO_2 and, perhaps, H_2S by $Ca(OH)_2$ (in cementitious materials) and CaO (a potential backfill additive). The code simulates these processes and interactions among them by converting reactants (steels, cellulose, etc.) to gases and other products at experimentally observed or estimated rates and plotting temporal reaction paths in three-dimensional phase diagrams for solids in the $Fe-H_2O-CO_2-H_2-H_2S$ system.

2572 (SAND-94-1667) Recommended strategy for the disposal of remote-handled transuranic waste. Bild, R.W. (Sandia National Lab., Albuquerque, NM (United States). Program Integration Dept.). Sandia National Labs., Albuquerque, NM (United States). Jul 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94015040. Source: OSTI; NTIS; INIS; GPO Dep.

The current baseline plan for RH TRU (remote-handled transuranic) waste disposal is to package the waste in special canisters for emplacement in the walls of the waste disposal rooms at the Waste Isolation Pilot Plant (WIPP). The RH waste must be emplaced before the disposal rooms are filled by contact-handled waste. Issues which must be resolved for this plan to be successful include: (1) construction of RH waste preparation and packaging facilities at large-quantity sites; (2) finding methods to get small-quantity site RH waste packaged and certified for disposal; (3) developing transportation systems and characterization facilities for RH TRU waste; (4) meeting lag storage needs; and (5) gaining public acceptance for the RH TRU waste program. Failure to resolve these issues in time to permit disposal according to the WIPP baseline plan will force either modification to the plan, or disposal or long-term storage of RH TRU waste at non-WIPP sites. The recommended strategy is to recognize, and take the needed actions to resolve, the open issues preventing disposal of RH TRU waste at WIPP on schedule. It is also recommended that the baseline plan be upgraded by adopting enhancements such as revised canister emplacement strategies and a more flexible waste transport system.

2573 (SAND-94-1916C) Above-ground and in situ field screening of VOCs using Portable Acoustic Wave Sensor (PAWS) systems. Frye, G.C. (Sandia National Labs., Albuquerque, NM (United States)); Cernosek, R.W.; Steinfert, T.D.; Gilbert, D.W.; Colburn, C. Sandia National Labs., Albuquerque, NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950290-1: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Pittsburgh, PA (United States), 22-24 Feb 1995). Order Number DE95011055. Source: OSTI; NTIS; INIS; GPO Dep.

PAWS systems have been developed for real-time, on-line and in situ monitoring of volatile organic compounds (VOCs). These systems utilize the high sensitivity of surface acoustic wave (SAW) devices to changes in the mass or other physical properties of a film cast onto the device surface. Using thin polymer films that rapidly (few seconds) and reversibly absorb the chemical species of interest, these

sensors can be used to detect and monitor a wide range of VOCs. Current minimum detection levels range from about 1 to 10 ppm for typical VOCs in a real-time mode and, by incorporating an adsorbent preconcentrator, periodic (every few minutes) analysis down to the 10 - 100 ppb range, even in the presence of high concentrations of corrosive vapors, can be achieved. Sensor responses are reproducible, leading to accurate measurements, and the devices can operate over a wide concentration range. Above ground and down-hole systems have been demonstrated at environmental restoration sites for: (1) on-line monitoring of off-gas streams from soil vapor extractions, (2) real-time analysis of gas samples pulled to the surface from a cone penetrometer probe, and (3) in situ monitoring of contaminants in vadose zone monitoring wells.

2574 (SAND-94-2128) A Monte Carlo procedure for the construction of complementary cumulative distribution functions for comparison with the EPA release limits for radioactive waste disposal. Helton, J.C.; Shiver, A.W. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95008153. Source: OSTI; NTIS; INIS; GPO Dep.

A Monte Carlo procedure for the construction of complementary cumulative distribution functions (CCDFs) for comparison with the US Environmental Protection Agency (EPA) release limits for radioactive waste disposal (40 CFR 191, Subpart B) is described and illustrated with results from a recent performance assessment (PA) for the Waste Isolation Pilot Plant (WIPP). The Monte Carlo procedure produces CCDF estimates similar to those obtained with stratified sampling in several recent PAs for the WIPP. The advantages of the Monte Carlo procedure over stratified sampling include increased resolution in the calculation of probabilities for complex scenarios involving drilling intrusions and better use of the necessarily limited number of mechanistic calculations that underlie CCDF construction.

2575 (SAND-94-2134C) Correlation of theoretical calculations and experimental measurements of damage around a shaft in salt. Munson, D.E. (Sandia National Labs., Albuquerque, NM (United States)); Holcomb, D.J.; DeVries, K.L.; Brodsky, N.S.; Chan, K.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655-3: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95004525. Source: OSTI; NTIS; INIS; GPO Dep.

Cross-hole ultrasonic measurements were made in the immediate wall of the Air Intake Shaft of the Waste Isolation Pilot Plant facility. These measurements show that compressional wave speed markedly decreases at the shaft wall and then increases with radial distance from the shaft to eventually become that of solid or undamaged salt. This behavior is indicative of deformation damage or microfractures in the salt. These in situ data are compared to both laboratory measurements of wave speed as a function of volume dilatancy and to calculations based on the Multimechanism Deformation Coupled Fracture model, with reasonable agreement.

2576 (SAND-94-2136C) Constitutive representation of damage development and healing in WIPP salt. Chan, K.S. (Southwest Research Inst., San Antonio, TX (United States)); Bodner, S.R.; Fossum, A.F.; Munson, D.E. Sandia

National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655-2: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95004524. Source: OSTI; NTIS; INIS; GPO Dep.

There has been considerable interest in characterizing and modeling the constitutive behavior of rock salt with particular reference to long-term creep and creep failure. The interest is motivated by the projected use of excavated rooms in salt rock formations as repositories for nuclear waste. It is presumed that closure of those rooms by creep ultimately would encapsulate the waste material, resulting in its effective isolation. A continuum mechanics approach for treating damage healing is formulated as part of a constitutive model for describing coupled creep, fracture, and healing in rock salt. Formulation of the healing term is, described and the constitutive model is evaluated against experimental data of rock salt from the Waste Isolation Pilot Plant (WIPP) site. The results indicate that healing anisotropy in WIPP salt can be modeled with an appropriate power-conjugate equivalent stress, kinetic equation, and evolution equation for damage healing.

2577 (SAND-94-2266C) Performance assessment methodology as applied to the Greater Confinement Disposal site: Preliminary results of the third performance iteration. Brown, T.J. (Sandia National Labs., Albuquerque, NM (United States)); Baer, T.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-58: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95007729. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has contracted Sandia National Laboratories to conduct a performance assessment of the Greater Confinement Disposal facility, Nevada. The performance assessment is an iterative process in which transport models are used to prioritize site characterization data collection. Then the data are used to refine the conceptual and performance assessment models. The results of the first two performance assessment iterations indicate that the site is likely to comply with the performance standards under the existing hydrologic conditions. The third performance iteration expands the conceptual model of the existing transport system to include possible future events and incorporates these processes in the performance assessment models. The processes included in the third performance assessment are climate change, bioturbation, plant uptake, erosion, upward advection, human intrusion and subsidence. The work completed to date incorporates the effects of bioturbation, erosion and subsidence in the performance assessment model. Preliminary analyses indicate that the development of relatively deep-rooting plant species at the site, which could occur due to climate change, irrigated farming or subsidence, poses the greatest threat to the site's performance.

2578 (SAND-94-2313C) Dynamic compaction of salt: Initial demonstration and performance testing. Hansen, F.D. (Sandia National Labs., Albuquerque, NM (United States)); Ahrens, E.H.; Tidwell, V.C.; Tillerson, J.R.; Brodsky, N.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655-4: 35. US symposium on rock mechanics, South

Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95004776. Source: OSTI; NTIS; INIS; GPO Dep.

Reconsolidated crushed salt is proposed as the sole long-term shaft seal between the Waste Isolation Pilot Plant (WIPP) and the biosphere. The concept for a long-term shaft seal for the WIPP repository is to place crushed salt in the four shafts and to develop an effective seal as the surrounding salt creeps into the shafts, reconsolidating the salt. Permeability of the salt components is calculated to achieve performance objectives at some acceptable time in the future, an expectation which is a key to performance assessment calculations for the WIPP. Such a seal has never been constructed, and until now no performance measurements have been made on an appropriately large scale. A full understanding of construction methods, achievable initial density and permeability and time-wise performance of reconsolidating salt is required. This paper discusses nearly full-scale dynamic compaction of mine-run WIPP salt, preliminary measurements of density and permeability, and their variability within a relatively large volume of compacted material.

2579 (SAND-94-2348C) Use of a scenario-development procedure to identify potentially disruptive scenarios, Greater Confinement Disposal facility, Area 5, Nevada Test Site. Guzowski, R.V. (Science Applications International Corp., San Diego, CA (United States)). Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-59: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007730. Source: OSTI; NTIS; INIS; GPO Dep.

The Greater Confinement Disposal (GCD) facility includes four boreholes that contain transuranic (TRLT) waste. Presence of the TRU waste means that this facility must comply with the US Environmental Protection Agency's Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Waste-Final Rule 40 CFR Part 191. To comply with the Containment Requirements of this rule, all potentially disruptive events and processes, and by implication all potentially disruptive combinations of events and processes (scenarios), must be identified for possible inclusion in performance assessments. Screening of the FEPs identified four events for scenario development: exploratory drilling for natural resources, drilling withdrawal wells, irrigation, and subsidence. Recent environmental-isotope analyses of the vadose zone suggest that radionuclide transport from the boreholes to the water table by infiltration is not a feasible transport mechanism within the time frame of regulatory concern. For this reason, the event of drilling withdrawal wells was merged with exploratory drilling for resources. The descriptions of the remaining three events were modified slightly to aid in estimation of event probabilities and consequence analyses. The three events are: exploratory drilling for resources penetrates a TRU borehole, irrigation occurs at the Radioactive Waste Management Site (RWMS), and subsidence occurs at the RWMS. Use of a logic diagram with these three events resulted in the construction of eight scenarios, including base-case (undisturbed) conditions. Screening these scenarios at this stage of scenario development was beyond the scope of this task. Based on the implementation assumptions, this scenario-development procedure produced a comprehensive set of mutually exclusive scenarios that are reproducible and auditable for use in GCD performance assessments.

2580 (SAND-94-8699C) Tunable diode lasers as continuous emission monitors for thermal waste treatment processes. Allendorf, S.W. (Sandia National Labs., Livermore, CA (United States)); Ottesen, D.K.; Johnsen, H.A.; Wang, J.; Frish, M.D.; Trembley, D.G.; Severance, R.; Boni, A.A. Sandia National Labs., Livermore, CA (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. (CONF-940528-7: 13. international symposium on thermal treatment technologies, Houston, TX (United States), 9-13 May 1994). Order Number DE95004381. Source: OSTI; NTIS; GPO Dep.

In this paper the ongoing program to develop and apply a family of on-line process monitors is described. This technique detects molecular gas-phase species by optical absorption using vibrational transitions in the near-infrared region. Near-infrared, tunable diode lasers are used that emit extremely narrow, single-mode radiation. Current efforts include laboratory work to identify the optimum absorption lines for the molecular species of interest. Sensors based on tunable diode lasers are being developed in parallel with this scoping work. One such instrument, designed to monitor ammonia, has been constructed and field-tested; its specification and performance are discussed.

2581 (SAND-95-0117C) Recent progress in scenario development for the WIPP. Galson, D.A. (Galson Sciences Limited, Oakham, Rutland (United Kingdom)); Swift, P.N. Sandia National Labs., Albuquerque, NM (United States). 19 Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950570-5: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006309. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is preparing to request the US Environmental Protection Agency to certify compliance with the radioactive waste disposal standards found in 40 CFR Part 191 for the Waste Isolation Pilot Plant (WIPP). The DOE will also need to demonstrate compliance with a number of other State and Federal standards and, in particular, the Land Disposal Restrictions of the Resource Conservation and Recovery Act (RCRA), 40 CFR Part 268. Demonstrating compliance with these regulations requires an assessment of the long-term performance of the WIPP disposal system. Re-evaluation and extension of past scenario development for the WIPP forms an integral part of the ongoing performance assessment (PA) process.

2582 (SAND-95-0436C) Steam reforming of DOE complex waste simulants. Miller, J.E.; Kuehne, P.B. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-79: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008529. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories has worked with Synthetica Technologies and Manufacturing and Technology Conversion International (MTCI) to demonstrate the applicability of their commercial steam reforming technologies for treating DOE low-level mixed wastes. Previously, Synthetica successfully demonstrated destruction of a Sandia formulated lab trash simulant. During November 1994 Synthetica did not adequately process the aqueous halogenated organic liquid mixed waste simulant (MWTP-2110) formulated by the DOE Mixed Waste Integrated Program (MWIP). Testing at

MTCI is ongoing and initial results appear to be favorable. Approximately 200 lbs each of the MWIP aqueous halogenated organic liquids (MWTP-2110), and absorbed aqueous and organic liquids (MWTP-3113/3114) simulants have been processed. At 1650°F, destruction efficiencies of greater than 99% were obtained for tetrachloroethylene, toluene, and 1,2 dichlorobenzene. Product cases consisted primarily of H₂, CO₂, CO, and CH₄ and had higher heating values of up to 355 BTU/SCF. Conclusions concerning the suitability of the MTCI process for treating DOE mixed wastes will be drawn upon the completion of testing.

2583 (SAND-95-0495) Hazardous materials management using a Cradle-to-Grave Tracking and Information System (CGTIS). Kjeldgaard, E. (Sandia National Labs., Albuquerque, NM (United States)); Fish, J.; Campbell, D.; Freshour, N.; Hammond, B.; Bray, O.; Hollingsworth, M. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009540. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous materials management includes interactions among materials, personnel, facilities, hazards, and processes of various groups within a DOE site's environmental, safety & health (ES&H) and line organizations. Although each group is charged with addressing a particular aspect of these properties and interactions, the information it requires must be gathered into a coherent set of common data for accurate and consistent hazardous material management and regulatory reporting. It is these common data requirements which the Cradle-to-Grave Tracking and Information System (CGTIS) is designed to satisfy. CGTIS collects information at the point at which a process begins or a material enters a facility, and maintains that information, for hazards management and regulatory reporting, throughout the entire life-cycle by providing direct on-line links to a site's multitude of data bases to bring information together into one common data model.

2584 (SAND-95-0564C) Using TOUGH2 to model the coupled effects of gas generation, repository consolidation, and multiphase brine and gas flow at the Waste Isolation Pilot Plant. Freeze, G.A. (INTERA Inc., Albuquerque, NM (United States)); Larson, K.W.; Davies, P.B.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116-5: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009592. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a US Department of Energy facility designed to demonstrate the safe underground disposal of transuranic waste. Following waste emplacement, each room will be backfilled with crushed salt. Due to deviatoric stress introduced by excavation, the walls of the waste disposal rooms in the repository will deform over time, consolidating waste containers and salt backfill, thereby decreasing the void volume of the repository. Long-term repository assessment must consider the processes of gas generation, room closure and expansion due to salt creep, and multiphase (brine and gas) fluid flow, as well as the complex coupling between these three processes. Stone (1992) used the mechanical creep closure code SANCHO to simulate the closure of a single, perfectly sealed disposal room filled with waste and backfill. The results of the SANCHO f-series simulations provide a relationship between gas generation, room closure, and room

pressure. Several methods for coupling this relationship with multiphase fluid flow into and out of a room were examined by Freeze et al. TOUGH2 was employed to couple the processes of gas generation, room closure/consolidation, and multiphase brine and gas flow. Two empirically-based methods for approximating salt creep and room consolidation were implemented in TOUGH2: the pressure-time-porosity line interpolation approach and the fluid-phase-salt approach. Both approaches utilized links to the SANCHO f-series simulation results to calculate room-void-volume changes with time during a simulation.

2585 (SAND-95-0565C) The effect of stratigraphic dip on multiphase flow at the Waste Isolation Pilot Plant. Webb, S.W.; Larson, K.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND-95-2257C; CONF-9503116-6: 1995 TOUGH workshop; National heat transfer conference, Berkeley, CA (United States); Portland, OR (United States), 20-22 Mar 1995; 5-9 Aug 1995; CONF-950828-20). Order Number DE95009591. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a US Department of Energy research and development facility for the underground disposal of transuranic waste from US defense-related activities. The WIPP repository is located within the Salado Formation, which is comprised of beds of pure and impure halite with thin interbeds of anhydrite and related clay seams. This formation is brine saturated with a pore pressure of approximately 12.5 MPa at the repository horizon. The Salado Formation dips gently southeast, on the average approximately 1°, with steeper dips locally. Elevated repository pressures, caused by gas generated as emplaced waste corrodes and degrades, may drive brine and gas out of the repository into the surrounding formation. Stratigraphic dip may cause increased brine inflow to the repository through countercurrent flow in the interbeds and enhanced gas migration distances in the updip direction due to buoyancy. Two-dimensional simulations of isolated WIPP repository room have been performed using TOUGH2 for horizontal and 1° dipping stratigraphy. The impact of dip on multiphase flow at the WIPP may be significant. With dip, an additional mechanism for brine inflow may occur, namely the formation of a cell of countercurrent brine and gas flow in the interbeds. The additional volume of brine inflow resulting from the countercurrent flow cell may be of similar magnitude to brine inflow without dip. Therefore, dip must be included in any repository model to include the countercurrent brine inflow mechanism. Gas migration may also be significantly influenced due to dip. Gas migration distances may increase dramatically with preferential migration updip.

2586 (SAND-95-0568C) Modification and application of TOUGH2 as a variable-density, saturated-flow code and comparison to SWIFT II results. Christian-Frear, T.L.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116-3: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009596. Source: OSTI; NTIS; INIS; GPO Dep.

Human intrusion scenarios at the Waste Isolation Pilot Plant (WIPP) involve penetration of the repository and an underlying brine reservoir by a future borehole. Brine and gas from the brine reservoir and the repository may flow up the borehole and into the overlying Culebra formation, which

is saturated with water containing different amounts of dissolved solids resulting in a spatially varying density. Current modeling approaches involve perturbing a steady-state Culebra flow field by inflow of gas and/or brine from a breach borehole that has passed through the repository. Previous studies simulating steady-state flow in the Culebra have been done. One specific study by LaVenue et al. (1990) used the SWIFT 2 code, a single-phase flow and transport code, to develop the steady-state flow field. Because gas may also be present in the fluids from the intrusion borehole, a two-phase code such as TOUGH2 can be used to determine the effect that emitted fluids may have on the steady-state Culebra flow field. Thus a comparison between TOUGH2 and SWIFT2 was prompted. In order to compare the two codes and to evaluate the influence of gas on flow in the Culebra, modifications were made to TOUGH2. Modifications were performed by the authors to allow for element-specific values of permeability, porosity, and elevation. The analysis also used a new equation of state module for a water-brine-air mixture, EOS7 (Pruess, 1991), which was developed to simulate variable water densities by assuming a miscible mixture of water and brine phases and allows for element-specific brine concentration in the INCON file.

2587 (SAND-95-0587C) Summary of applications of TOUGH2 to the evaluation of multiphase flow processes at the WIPP. Webb, S.W. (Sandia National Labs., Albuquerque, NM (United States)); Larson, K.W.; Freeze, G.A.; Christian-Frear, T.L. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116-4: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009593. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a US Department of Energy (DOE) research and development facility for the underground disposal of transuranic waste in southeastern New Mexico. The WIPP repository is located 655 m below the land surface in the lower portion of the Salado Formation, which is comprised of beds of pure and impure halite with thin interbeds of anhydrite and related clay seams. The regional dip of the Salado Formation is approximately 1° southeast in the vicinity of the repository. The proposed waste storage area has eight waste disposal panels, each of which will contain seven rooms. The repository is designed to follow a single stratigraphic horizon. Due to the dip, the north end of the repository will be about 10 meters higher than the south end. Waste that is emplaced in the disposal rooms will generate gas due to microbial degradation, anoxic corrosion, and radiolysis. Brine inflow to the rooms from the surrounding Salado Formation may significantly influence the gas generation rate and the total amount of gas generated. The salt surrounding the repository will creep in response to the excavation, reducing the room volume. Gas generation in the room may increase the pressure sufficiently to drive brine and gas into the surrounding Salado Formation. Migration of gas and brine in the Salado is an important factor in evaluating the performance of the repository. The studies summarized in this paper have been performed to evaluate brine and gas flow processes in the WIPP disposal system and to identify some of the important processes. These studies are done in support of, but are not part of, the formal Performance Assessment (PA) effort. Because of probabilistic and system-scale requirements, the PA effort uses the Sandia-developed BRAGFLO (BRine And Gas FLOW) code for multiphase flow calculations.

2588 (SD-WM-TP-30) Subsurface marker emplacement test plan. Adams, M.R.; Carlson, R.A. Rockwell International Corp., Richland, WA (United States). Rockwell Hanford Operations. 30 May 1986. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016433. Source: OSTI; NTIS; GPO Dep.

Current plans propose placing subsurface markers within protective barriers to deter potential human intrusion into disposed radioactive wastes. The subsurface markers would provide warning to the digging intruder should surface markers be removed, destroyed, or ignored. This plan sets forth procedures for testing the survivability of the subsurface markers during construction of the barrier. After the tests described herein are concluded, a decision can be made as to whether subsurface markers will require protection during barrier construction. If protection is required, additional tests will be needed to test the effectiveness of various protective approaches.

2589 (SWE-SWB-95-0004) Waste Minimization Measurement and Progress Reporting. Stone, K.A. Westinghouse Savannah River Co., Aiken, SC (United States). 13 Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-118: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95060100. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Savannah River Company is implementing productivity improvement concepts into the Waste Minimization Program by focusing on the positive initiatives taken to reduce waste generation at the Savannah River Site. Previous performance measures, based only on waste generation rates, proved to be an ineffective metric for measuring performance and promoting continuous improvements within the Program. Impacts of mission changes and non-routine operations impeded development of baseline waste generation rates and often negated waste generation trending reports. A system was developed to quantify, document and track innovative activities that impact waste volume and radioactivity/toxicity reductions. This system coupled with Management-driven waste disposal avoidance goals is proving to be a powerful tool to promote waste minimization awareness and the implementation of waste reduction initiatives. Measurement of waste not generated, in addition to waste generated, increases the credibility of the Waste Minimization Program, improves sharing of success stories, and supports development of regulatory and management reports.

2590 (UCRL-ID-119706) Production and preliminary testing of multianalyte imaging sensor arrays. Richards, J.B. (Lawrence Livermore National Lab., CA (United States)); Brown, S.B.; Milanovich, F.P.; Healey, B.G.; Chadha, S.; Walt, D.R. Lawrence Livermore National Lab., CA (United States). Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009468. Source: OSTI; NTIS; GPO Dep.

This report covers the production and preliminary testing of fiber optic sensors that contain a discrete array of analyte specific sensors on their distal ends. The development of the chemistries associated with this technology is covered elsewhere.

2591 (UCRL-ID-120404) Development of the Indicator-photopolymer chemistries for multianalyte

sensor arrays. Healey, B.G. (Tufts Univ., Medford, MA (United States). Max Tishler Laboratory for Organic Chemistry); Chadha, S.; Walt, D.R.; Richards, J.B.; Brown, S.B.; Milanovich, F.P. Lawrence Livermore National Lab., CA (United States). Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009670. Source: OSTI; NTIS; GPO Dep.

Remediation of ground and waste water facilities requires the analysis of the pollutants. Multianalyte fiber-optic chemical sensors based on indicators have been developed, with multiple indicators immobilized at the distal end of a single imaging fiber. By coupling the imaging fibers to a charge coupled device detector, one can spatially and spectrally discriminate the multiple sensing sites and hence monitor multiple analyte concentrations simultaneously. This report describes the development of the indicator chemistry and immobilization procedures developed for pH, Al^{3+} , and hydrocarbons. A polymer matrix is used to mass transfer the analyte to the indicator.

2592 (UCRL-JC-110055-Rev.1) Monitoring remediation of trichloroethylene using a chemical fiber optic sensor: Field studies. Colston, B.W.; Brown, S.B.; Langry, K.; Daley, P.; Milanovich, F.P. Lawrence Livermore National Lab., CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-920851-90-Rev.1: Spectrum '92: nuclear and hazardous waste management international topical meeting, Boise, ID (United States), 23-27 Aug 1992). Order Number DE95004967. Source: OSTI; NTIS; INIS; GPO Dep.

Current US Department of Energy (DOE) policy requires characterization and subsequent remediation of areas where trichloroethylene (TCE) has been discharged into the soil and groundwater. Technology that allows trace quantities of this contaminant to be measured in situ on a continuous basis is needed. Fiber optic chemical sensors offer a promising low cost solution. Field tests of such a fiber optic chemical sensor for TCE have recently been completed. Sensors have been used to measure TCE contamination at Savannah River Site (SRS) and Lawrence Livermore National Laboratory Site 300 (S300) in the groundwater and vadose zones. Both sites are currently undergoing remediation processes.

2593 (UCRL-JC-113790-Rev.2) DOE capabilities for in-situ characterization and monitoring of formation properties in the vadose zone: Revision 2. Hearst, J.R. (Lawrence Livermore National Lab., CA (United States)); Brodeur, J.R.; Koizumi, C.J.; Conaway, J.G.; Mikesell, J.L.; Nelson, P.H.; Stromswold, D.C.; Wilson, R.D. Lawrence Livermore National Lab., CA (United States). Sep 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931095-39-Rev.2: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94011757. Source: OSTI; NTIS; GPO Dep.

The DOE Environmental Restoration (ER) Program faces the difficult task of characterizing the properties of the subsurface and identifying and mapping a large number of contaminants at landfills, surface disposal areas, spill sites, nuclear waste tanks, and subsurface contaminant plumes throughout the complex of DOE facilities. Geophysical borehole logs can measure formation properties such as bulk density, water content, and lithology, and can quantitatively analyze for radionuclides and such elements as chlorine

and heavy metals. Since these measurements can be repeated as desired, they can be used for both initial characterization and monitoring of changes in contaminant concentration and water content (sometimes linked to contaminant migration), at a fraction of the cost of conventional sampling. The techniques developed at several DOE laboratories, and the experience that we have gained in making in-situ measurements in the vadose zone, are applicable to problems at many other DOE sites. Moreover, they can capitalize on existing inventories of boreholes. By building on this experience workers involved in ER projects at those sites should be able to obtain high-quality data at substantial reductions in cost and time.

2594 (UCRL-JC-115886) Assessing data quality for a federal environmental restoration project: Rationalizing the requirements of multiple clients. Kiszka, V.R.; Carlsen, T.M. Lawrence Livermore National Lab., CA (United States). Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940790-4: 10. annual waste testing and quality assurance symposium, Arlington, VA (United States), 11-15 Jul 1994). Order Number DE94017414. Source: OSTI; NTIS; INIS; GPO Dep.

Most environmental restoration projects at federal facilities face the difficult task of melding the quality assurance (QA) requirements of multiple clients, as well as dealing with historical data that are often of unknown quality. At Lawrence Livermore National Laboratory (LLNL), we have successfully integrated the requirements of our multiple clients by carefully developing a QA program that efficiently meets our clients' needs. The Site 300 Experimental Test Site is operated by LLNL in support of its national defense program. The responsibility for conducting environmental contaminant investigations and restoration at Site 300 is vested in the Site 300 Environmental Restoration Project (Site 300 ERP) of LLNL's Environmental Restoration Division. LLNL Site 300 ERP must comply with the QA requirements of several clients, which include: the LLNL Environmental Protection Department, the DOE, the US Environmental Protection Agency-Region IX (EPA), the California Regional Water Quality Control Board - Central Valley Region, and the California Department of Toxic Substances Control. This comprehensive QA program was used to determine the acceptability of historical data. The Site 300 ERP began soil and ground water investigations in 1982. However, we did not begin receiving analytical quality assurance/quality control (QA/QC) data until 1989; therefore, the pre-1989 data that were collected are of unknown quality. The US EPA QAMS-005/80 defines data quality as the totality of features and characteristics of data that bears on its ability to satisfy a given purpose. In the current context, the characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability. Using our established QA program, we determined the quality of this historical data based on its comparability to the post-1989 data. By accepting this historical data, we were able to save a considerable amount of money in recharacterization costs.

2595 (UCRL-JC-118432) Fiber-optic sensors for rapid, inexpensive characterization of soil and ground water contamination. Milanovich, F.P.; Yow, J.L. Jr. Lawrence Livermore National Lab., CA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941152-1: Conference and exposition on petroleum hydrocarbons,

Houston, TX (United States), 2-4 Nov 1994). Order Number DE95002471. Source: OSTI; NTIS; INIS; GPO Dep.

The extent and complexity of worldwide environmental contamination are great enough that characterization, remediation, and performance monitoring will be extremely costly and lengthy. Characterization techniques that are rapid, inexpensive, and simple and that do not generate waste are urgently needed. Towards this end LLNL is developing a fiber-optic chemical sensor technology for use in groundwater and vadose-zone monitoring. We use a colorimetric detection technique, based on an irreversible chemical reaction between a specific reagent and the target compound. The accuracy and sensitivity of the sensor (<5 ppb by weight in water, determined by comparison with gas chromatographic standard measurements) are sufficient for environmental monitoring of trichloroethylene (TCE) and chloroform.

2596 (WHC-EP-0544-Rev.1) 340 Waste Handling Facility comparison with 40 CFR 61, Subpart H, and other referenced guidelines for stack 340-NT-EX. Revision 1. Hagerty, K.J.; Perry, J.K. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010201. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the provisions of sections of 40 CFR 61, 40 CFR 60, and ANSI N13.1-1969 and provides an explanation of compliance measures being performed at Hanford. The sections covered pertain to Subpart H, National emissions standards for emissions of radionuclides other than radon from US DOE facilities; Appendix A (40 CFR 60), Reference method 2, Determination of stack gas velocity and volumetric flow rate and Reference method 1, Sample and velocity traverses for stationary sources; ANSI, Guide to sampling airborne radioactive materials in nuclear facilities; and Method 114 Comparison for stack 340-NT-EX. This stack exhausts the 340 Facility which contains storage vaults from waste sent to the facility by PNL. Monitoring of I-131, tritium, uranium, radon-222, as well as gross alpha, beta, and gamma determinations are made.

2597 (WHC-EP-0707) 216-U-10 Pond and 216-Z-19 Ditch characterization studies. Last, G.V.; Duncan, D.W.; Graham, M.J.; Hall, M.D.; Hall, V.W.; Landeen, D.S.; Leitz, J.G.; Mitchell, R.M. Westinghouse Hanford Co., Richland, WA (United States). Feb 1994. 463p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013007. Source: OSTI; NTIS; INIS; GPO Dep.

Includes maps.

The chemical, reprocessing of spent nuclear fuels at the US Department of Energy's Hanford Site has generated large volumes of radioactive liquid effluents. The majority of these effluents have been used strictly for cooling or other supportive functions and have been discharged to ditches and ponds. The 216-U-10 Pond and 216-Z-19 Ditch are two such disposal facilities. These facilities are components of an integrated system of ditches, ponds, and overflow facilities collectively referred to as the U-Pond disposal system. The U-Pond system has been used since 1943 and has received a large variety of radioisotopes from several sources. This study covered the major aspects of the environment, including wind resuspension, biological uptake and transport, geologic distribution in surface and subsurface sediments, and ground-water impacts. The long-term use of

U-Pond and the Z-19 Ditch has resulted in the localized accumulation of transuranic and fission product inventories as a result of sorption and filtration of particulates onto the uppermost sediments.

2598 (WHC-EP-0718) Radioactive waste shipments to Hanford retrievable storage from Westinghouse Advanced Reactors and Nuclear Fuels Divisions, Cheswick, Pennsylvania. Duncan, D. (Westinghouse Hanford Co., Richland, WA (United States)); Pottmeyer, J.A.; Weyns, M.I.; Dicenso, K.D.; DeLorenzo, D.S. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94013971. Source: OSTI; NTIS; INIS; GPO Dep.

During the next two decades the transuranic (TRU) waste now stored in the burial trenches and storage facilities at the Hanford Site in southeastern Washington State is to be retrieved, processed at the Waste Receiving and Processing Facility, and shipped to the Waste Isolation Pilot Plant (WIPP), near Carlsbad, New Mexico for final disposal. Approximately 5.7 percent of the TRU waste to be retrieved for shipment to WIPP was generated by the decontamination and decommissioning (D&D) of the Westinghouse Advanced Reactors Division (WARD) and the Westinghouse Nuclear Fuels Division (WNFD) in Cheswick, Pennsylvania and shipped to the Hanford Site for storage. This report characterizes these radioactive solid wastes using process knowledge, existing records, and oral history interviews.

2599 (WHC-EP-0722) Systems Engineering functions and requirements for the Hanford Cleanup mission: First issue. Holmes, J.J. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94011339. Source: OSTI; NTIS; GPO Dep.

This report documents the top-level SE mission analysis, functions analysis, and requirements analysis for the Hanford Site cleanup mission. Because SE is an iterative process, this document will be continuously updated as the mission evolves. This first issue will be subject to change as lower-level work is conducted or primary system architecture is changed as a result of public involvement, NEPA processes, or changes in DOE/HQ direction.

2600 (WHC-EP-0722-Add.2) Systems engineering functions and requirements for the Hanford cleanup mission: First issue, Addendum 2. Holmes, J.J. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 324p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94011337. Source: OSTI; NTIS; GPO Dep.

This addendum provides the technical detail of a systems engineering functional analysis for the Hanford cleanup mission. Details of the mission analysis including mission statement, scope, problem statement, initial state definition, and final state definition are provided in the parent document. The functional analysis consists of Input Computer Automated Manufacturing Definition (IDEFO) diagrams and definitions, which will be understood by systems engineers, but which may be difficult for others to comprehend. For a more complete explanation of this work, refer to the parent document. The analysis covers the total Hanford cleanup mission including the decomposition levels at which the various Hanford programs or integrated activities are encountered.

2601 (WHC-EP-0722-Add.3-Draft) Systems engineering functions and requirements for the Hanford cleanup mission: First Issue: Addendum 3, Draft. Holmes, J.J. (Westinghouse Hanford Co., Richland, WA (United States)); Bailey, K.B.; Collings, J.L.; Hubbard, A.B.; Niepke, T.M. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015662. Source: OSTI; NTIS; INIS; GPO Dep.

This addendum provides additional information, in the form of Functional Flow Block Diagrams (FFBD), concerning the system engineering functional analysis for the Hanford cleanup mission. Details of the mission analysis including mission statement, scope, problem statement, initial state definition, and final state definition are provided in the parent document. The results of the functional analysis as depicted in Integrated Definition language notation (IDEFO) diagrams are provided in Addendum 2 to the parent document. The FFBDs provided herein cover the total Hanford cleanup mission and depict the decomposition of functions to a reasonable level for understanding (generally level 3 or 4). Functional definitions are contained in Section 3.0 of Addendum 2 to the parent document. Specific programs such as the Tank Waste Remediation System and Environmental Restoration, whose IDEFO diagrams were presented as part of their specific baseline documentation and not included in Addendum 2, have their FFBDs included in this addendum. The information contained in this addendum will remain tied to the overall Hanford cleanup mission through the top-level ("Capstone") functional analysis so that a complete, top-to-bottom functional documentation set always exists for all mission activities. This linkage is accomplished through the use of the Requirements Driven Design (RDD-100®) design tool. Through the use of RDD-100®, this addendum supports and is traceable to the information presented in Addendum 2 to the parent document.

2602 (WHC-EP-0741) Final report: Fiscal Year 1993 activities for the Line Loss Study. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010068. Source: OSTI; NTIS; INIS; GPO Dep.

Deficiencies in air monitoring and sampling systems at WHC, identified in WHC Compliance Plan CP89-16, include line loss quantification, potential proportional sampling errors, quantification of sampling/measurement system bias, and overall system calibrations. 'Tiger Team' assessment number A/BMPF-3 identifies line losses as a potential for large sampling errors. The objective of the work performed during FY 1993 was to provide reports and assessments for specific stack sampling systems on the associated particle line loss for those sampling lines.

2603 (WHC-EP-0768) Solid waste 30-year volume summary. Valero, O.J.; Armacost, L.L.; DeForest, T.J.; Templeton, K.J.; Williams, N.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 177p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014268. Source: OSTI; NTIS; INIS; GPO Dep.

A 30-year forecast of the solid waste volumes to be generated or received at the US Department of Energy Hanford Site is described in this report. The volumes described are low-level mixed waste (LLMW) and transuranic/transuranic mixed (TRU/TRUM) waste that will require treatment, storage, and disposal at Hanford's Solid Waste Operations

Complex (SWOC) during the 30-year period from FY 1994 through FY 2023. The data used to complete this document were collected from onsite and offsite waste generators who currently, or are planning to, ship solid wastes to the Hanford Site. An analysis of the data suggests that over 300,000 m³ of LLMW and TRU/TRUM waste will be managed at Hanford's SWOC over the next 30 years. An extensive effort was made this year to collect this information. The 1993 solid waste forecast was used as a starting point, which identified approximately 100,000 m³ of LLMW and TRU/TRUM waste to be sent to the SWOC. After analyzing the forecast waste volume, it was determined that additional waste was expected from the tank waste remediation system (TWRS), onsite decontamination and decommissioning (D&D) activities, and onsite remedial action (RA) activities. Data presented in this report establish a starting point for solid waste management planning. It is recognized that forecast estimates will vary (typically increasing) as facility planning and missions continue to change and become better defined, but the information presented still provides useful insight into Hanford's future solid waste management requirements.

2604 (WHC-EP-0769) Task E container corrosion studies: Annual report. Bunnell, L.R. (Pacific Northwest Lab., Richland, WA (United States)); Doremus, L.A.; Topping, J.B.; Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015661. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory is conducting the Solid Waste Technology Support Program (SWTSP) for Westinghouse Hanford Company (WHC). Task E is the Container Corrosion Study Portion of the SWTSP that will perform testing to provide defensible data on the corrosion of low-carbon steel, as used in drums to contain chemical and radioactive wastes at the Hanford Site. A second objective of Task E is to provide and test practical alternative materials that have higher corrosion resistance than low-carbon steel. The scope of work for fiscal year (FY) 1993 included initial testing of mild steel specimens buried in Hanford soils or exposed to atmospheric corrosion in metal storage sheds. During FY 1993, progress was made in three areas of Task E. First, exposure of test materials began at the Soil Corrosion Test Site where low-carbon steel specimens were placed in the soil in five test shafts at depths of 9 m (30 ft). Second, the corrosion measurement of low-carbon steel in the soil of two solid waste trenches continued. The total exposure time is $\approx$ 500 days. Third, an atmospheric corrosion test of low-carbon steel was put initiated in a metal shed (Building 2401-W) in the 200 West Area. This annual report describes the Task E efforts and provides a current status.

2605 (WHC-EP-0779-Draft) Architecture synthesis basis for the Hanford Cleanup system: First Issue. Holmes, J.J. (comp.). Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018003. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a set of candidate alternatives proposed to accomplish the Hanford Cleanup system functions defined in a previous work. Development of alternatives is part of a sequence of system engineering activities which lead to definition of all the products which,

when completed, accomplish the cleanup mission. The alternative set is developed to functional level four or higher depending on need.

2606 (WHC-EP-0783-Draft) Systems engineering product description report for the Hanford Cleanup Mission: First issue. Holmes, J.J. (Westinghouse Hanford Co., Richland, WA (United States)); Bailey, K.B.; Collings, J.L.; Hubbard, A.B.; Niepke, T.M. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 242p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018004. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the upper level physical and administrative (nonphysical) products that, when delivered, complete the Hanford Cleanup Mission. Development of product descriptions is a continuation of the Sitewide Systems Engineering work described in the Sitewide functional analysis, the architecture synthesis, and is consistent with guidance contained in the mission plan. This document provides a bridge between all three documents and the products required to complete the mission of cleaning up the Hanford Site.

2607 (WHC-EP-0787) Characterization of decontamination and decommissioning wastes expected from the major processing facilities in the 200 Areas. Amato, L.C. (Los Alamos Technical Associates, Kennewick, WA (United States)); Franklin, J.D.; Hyre, R.A.; Lowy, R.M.; Millar, J.S.; Pottmeyer, J.A.; Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 560p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019043. Source: OSTI; NTIS; INIS; GPO Dep.

This study was intended to characterize and estimate the amounts of equipment and other materials that are candidates for removal and subsequent processing in a solid waste facility when the major processing and handling facilities in the 200 Areas of the Hanford Site are decontaminated and decommissioned. The facilities in this study were selected based on processing history and on the magnitude of the estimated decommissioning cost cited in the Surplus Facilities Program Plan; Fiscal Year 1993 (Winship and Hughes 1992). The facilities chosen for this study include B Plant (221-B), T Plant (221-T), U Plant (221-U), the Uranium Trioxide (UO₃) Plant (224-U and 224-UA), the Reduction Oxidation (REDOX) or S Plant (202-S), the Plutonium Concentration Facility for B Plant (224-B), and the Concentration Facility for the Plutonium Finishing Plant (PFP) and REDOX (233-S). This information is required to support planning activities for current and future solid waste treatment, storage, and disposal operations and facilities.

2608 (WHC-EP-0790) Spent nuclear fuel project mission analysis report. Cramond, R. (and others); Paedon, R.J.; Hedengren, D.C.; Hotarek, W.J.; Jackson, B.A.; Moon, T.W.; Pyzel, D.R.; Short, S.M.; Theo, M.G.; Trimble, D.J. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010067. Source: OSTI; NTIS; INIS; GPO Dep.

A mission analysis is the first step in the Hanford Site Systems Engineering process. This report presents the Spent Nuclear Fuel Project (SNFP) mission analysis. The purpose of this mission analysis is to define the SNFP problem, the initial unacceptable conditions, the acceptable final conditions, external constraints and interfaces, and

resources required. Also, it establishes the basis for developing a system to resolve the SNFP problem so that the SNFP mission can be accomplished.

2609 (WHC-EP-0795) Spent nuclear fuels project characterization data quality objectives strategy. Lawrence, L.A. (Pacific Northwest Lab., Richland, WA (United States)); Thornton, T.A.; Redus, K.S. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005476. Source: OSTI; NTIS; INIS; GPO Dep.

A strategy is presented for implementation of the Data Quality Objectives (DQO) process to the Spent Nuclear Fuels Project (SNFP) characterization activities. Westinghouse Hanford Company (WHC) and the Pacific Northwest Laboratory (PNL) are teaming in the characterization of the SNF on the Hanford Site and are committed to the DQO process outlined in this strategy. The SNFP characterization activities will collect and evaluate the required data to support project initiatives and decisions related to interim safe storage and the path forward for disposal. The DQO process is the basis for the activity specific SNF characterization requirements, termed the SNF Characterization DQO for that specific activity, which will be issued by the WHC or PNL organization responsible for the specific activity. The Characterization Plan prepared by PNL defines safety, remediation, and disposal issues. The ongoing Defense Nuclear Facility Safety Board (DNFSB) requirement and plans and the fuel storage and disposition options studies provide the need and direction for the activity specific DQO process. The hierarchy of characterization and DQO related documentation requirements is presented in this strategy. The management of the DQO process and the means of documenting the DQO process are described as well as the tailoring of the DQO process to the specific need of the SNFP characterization activities. This strategy will assure stakeholder and project management that the proper data was collected and evaluated to support programmatic decisions.

2610 (WHC-EP-0801-Draft) Systems engineering product breakdown structure for the Hanford Cleanup Mission: First issue. Holmes, J.J. (Westinghouse Hanford Co., Richland, WA (United States)); Bailey, K.B.; Collings, J.L.; Hubbard, A.B.; Niepke, T.M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001579. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the product breakdown structure (PBS) for the upper level physical products that, when delivered, complete the Hanford Site Cleanup Mission. Development of the PBS is a continuation of the sitewide systems engineering work described in the sitewide functional analysis, the architecture synthesis, and the product description report and is generally consistent with guidance contained in the Hanford Mission Plan. The PBS presents the interrelationship of products produced by the functions that are necessary to perform the clean up mission from their initial source through interim products to final product disposition.

2611 (WHC-EP-0822) Assessment report for Hanford analytical services quality assurance plan. Taylor, L.H. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 293p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930.

Order Number DE95003994. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the assessment results of DOE/RL-94-55, Hanford Analytical Services Quality Assurance Plan. The assessment was conducted using the Requirement and Self-Assessment Database (RSAD), which contains mandatory and nonmandatory DOE Order statements for the relevant DOE orders.

2612 (WHC-EP-0823) Synthetic waste chemical mechanism studies. Ashby, E.C. (Georgia Inst. of Tech., Atlanta, GA (United States)); Annis, A.; Barefield, E.K. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 177p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002971. Source: OSTI; NTIS; INIS; GPO Dep.

This research involved three main tasks: Kinetic studies of gas evolution and metal complexant decomposition in simulated waste media (SWM); Product identification from metal complexant decomposition in SWM; and Determination of the pathway by which N_2O , N_2 , and NH_3 are formed in SWM. Results are given on these 3 tasks under the following subtitles: 1. Kinetic studies—Reactions of HEDTA in SWM at different temperatures; Determination of the activation energies for gas formation in HEDTA decomposition under argon; Kinetics and mechanism of thermal degradation of glycolate in SWM; A possible explanation for the temperature dependence of gaseous product ratios for reactions of HEDTA and glycolate; Stoichiometry and kinetics of decomposition of nitrosamines; and Factors affecting the reactions of HEDTA, EDTA, and related compounds in SWM; 2. Product identification—Identification of HEDTA degradation products using ^{13}C NMR spectroscopy; Identification of irradiated HEDTA degradation products using NMR; Degradation of model systems in SWM; and Role of Al in degradation of organic complexants; 3. Source of gases—Reactions in SY1-SIM-91B mixtures utilizing N-15 labelled reagents; Decomposition of nitrous oxide; Mechanistic pathways for formation of gases containing nitrogen from nitrite; and A redox analysis of HEDTA decomposition—How much ammonia might be formed?

2613 (WHC-EP-0830-Vol.1) Hanford Spent Nuclear Fuel Project recommended path forward. Fulton, J.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003216. Source: OSTI; NTIS; INIS; GPO Dep.

The Spent Nuclear Fuel Project (the Project), in conjunction with the U.S. Department of Energy-commissioned Independent Technical Assessment (ITA) team, has developed engineered alternatives for expedited removal of spent nuclear fuel, including sludge, from the K Basins at Hanford. These alternatives, along with a foreign processing alternative offered by British Nuclear Fuels Limited (BNFL), were extensively reviewed and evaluated. Based on these evaluations, a Westinghouse Hanford Company (WHC) Recommended Path Forward for K Basins spent nuclear fuel has been developed and is presented in Volume I of this document. The recommendation constitutes an aggressive series of projects to construct and operate systems and facilities to safely retrieve, package, transport, process, and store K Basins fuel and sludge. The overall processing and storage scheme is based on the ITA team's proposed passivation and vault storage process. A dual purpose staging and vault storage facility provides an innovative feature which allows accelerated removal of fuel and sludge from

the basins and minimizes programmatic risks beyond any of the originally proposed alternatives. The projects fit within a regulatory and National Environmental Policy Act (NEPA) overlay which mandates a two-phased approach to construction and operation of the needed facilities. The two-phase strategy packages and moves K Basins fuel and sludge to a newly constructed Staging and Storage Facility by the year 2000 where it is staged for processing. When an adjoining facility is constructed, the fuel is cycled through a stabilization process and returned to the Staging and Storage Facility for dry interim (40-year) storage. The estimated total expenditure for this Recommended Path Forward, including necessary new construction, operations, and deactivation of Project facilities through 2012, is approximately \$1,150 million (unescalated).

2614 (WHC-EP-0830-Vol.2) Hanford Spent Nuclear Fuel Project: Recommended path forward: Volume 2: Alternatives and path forward evaluation. Fulton, J.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 515p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003217. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Spent Nuclear Fuel Project has completed an evaluation of four alternatives for expediting the removal of spent nuclear fuel from the K Basins and stabilizing and placing the fuel into interim storage. Four alternatives were compared: (1) Containerizing fuel in the K Basins, transporting fuel to a facility for stabilization, and interim storage of stabilized fuel in a dry storage facility (DSF); (2) Containerizing fuel in the K Basins, transporting fuel to a wet temporary staging facility, moving fuel to a facility for stabilization, and transporting stabilized fuel to an interim DSF; (3) Containerizing fuel in the K Basins in multi-canister overpacks, transporting fuel directly to a stabilization facility for passivation in the overpack, and interim storage of stabilized fuel in a DSF; (4) Packaging fuel for transport overseas and shipping fuel to a foreign reprocessing facility for reprocessing with eventual return of U, Pu and vitrified high level waste. The comparative evaluation consisted of a multi-attribute utility decision analysis, a public, worker and environmental health risk assessment, and a programmatic risk evaluation. The evaluation concluded that the best Path Forward combines the following concepts: Removal of K Basin fuel and sludge is uncoupled from the operation of a stabilization facility; A storage capability is provided to act as a lag storage or staging operation for overpack fuel containers as they are removed from the K Basins; Metal fuel drying and passivation should be maintained as the fuel stabilization process with the option of further refinements as more information becomes available; and The near term NEPA strategy should focus on expeditious removal of fuel and sludge from K Basins and placing overpacked fuel in temporary storage.

2615 (WHC-EP-0830-Vol.3) Hanford spent nuclear fuel project recommended path forward, volume III: Alternatives and path forward evaluation supporting documentation. Fulton, J.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006835. Source: OSTI; NTIS; INIS; GPO Dep.

Volume I of the Hanford Spent Nuclear Fuel Project - Recommended Path Forward constitutes an aggressive series of projects to construct and operate systems and facilities to safely retrieve, package, transport, process, and store K Basins fuel and sludge. Volume II provided a comparative

evaluation of four Alternatives for the Path Forward and an evaluation for the Recommended Path Forward. Although Volume II contained extensive appendices, six supporting documents have been compiled in Volume III to provide additional background for Volume II.

2616 (WHC-EP-0848) Preliminary Hanford technical input for the Department of Energy programmatic spent nuclear fuel management and Idaho National Engineering Laboratory environmental restoration and waste management programs environmental impact statement. Bergsman, K.H. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008792. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is currently evaluating its programmatic options for the safe management of its diverse spent nuclear fuel (SNF) inventory in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (SNF and INEL EIS). In the SNF and INEL EIS, the DOE is assessing five alternatives for SNF management, which consider at which of the DOE sites each of the various SNF types should be managed until ultimate disposition. The range of SNF inventories considered for management at the Hanford Site in the SNF and INEL EIS include the current Hanford Site inventory, only the current Hanford Site defense production SNF inventory, the DOE complex-wide SNF inventory, or none at all. Site-specific SNF management decisions will be evaluated in separate National Environmental Policy Act evaluations. Appendixes A and B include information on (1) additional facilities required to accommodate inventories of SNF within each management alternative, (2) existing and new SNF management facility descriptions, (3) facility costs for construction and operation, (4) facility workforce requirements for construction and operation, and (5) facility discharges. The information was extrapolated from existing analyses to the extent possible. New facility costs, manpower requirements, and similar information are based on rough-order-of-magnitude estimates.

2617 (WHC-EP-0852) Final report on fiscal year 1994 activities for the line loss study. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010066. Source: OSTI; NTIS; INIS; GPO Dep.

The Line Loss study has been a four-year effort to provide data and analysis for air monitoring and sampling systems at Hanford. This document presents the results of measurements obtained from the Plutonium-Uranium Extraction (PUREX) Plant and T Plant Main Stacks obtained during FY 1994. The work performed during FY 1994 was consistent with the action plans contained in Compliance Plan CP89-16. The study was initiated in 1991 in response to Tiger Team items A/CF-1 and A/BMPF-3 regarding representative sampling for the stack record samplers at some of the main Hanford Site stacks. Representative sampling is a compliance requirement for 40 CFR 61. The US EPA Compliance Order and Information Request received by the US DOE Richland Operations Office (RL) in February, 1993, also requested scheduling information for the study. RL received a letter in September, 1993, from the EPA stating their current views that estimates of line losses are considered adequate

for the 40 CFR 61 Subpart H-affected stacks. The EPA has no further formal interest in the study, although they are still interested in receiving results of the study. The work performed during FY 1991 and FY 1992 generated the initial data on line losses and assisted in the development of evaluation and assessment methods that could be used to determine potential line losses in other Hanford stack monitoring systems. The work performed during FY 1993 included measurements on sampling lines associated with the PUREX Main Stack and the B Plant Main Stack. The cascade impactor measurements on the PUREX Main Stack were repeated during FY 1994 because of operational problems during the FY 1993 measurements. The analyses for the B Plant samples had not been received before the delivery date for the final report on the FY 1993 activities. The decision was made to publish a separate report specifically for the B Plant results during FY 1994 after the results had been received from the laboratory and verified.

2618 (WHC-MR-0489) Glass science tutorial: Lecture No. 4, commercial glass melting and associated air emission issues. Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007818. Source: OSTI; NTIS; INIS; GPO Dep.

This document serves as a manual for a workshop on commercial glass melting and associated air emission issues. Areas covered include: An overview of the glass industry; Furnace design and construction practices; Melting furnace operation; Energy input methods and controls; Air legislation and regulations; Soda lime emission mechanisms; and, Post furnace emission controls. Supporting papers are also included.

2619 (WHC-SA-1455) Accelerated clean-up at the Hanford Site. Frain, J.M.; Johnson, W.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-920307-103: Waste management '92, Tucson, AZ (United States), 1-5 Mar 1992). Order Number DE94017416. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site began operations in 1943 as one of the sites for plutonium production associated with the Manhattan Project. It has been used, in part, for nuclear reactor operation, reprocessing of spent fuel, and management of radioactive waste. The Hanford Site covers approximately 1,434 km² (560 mi²) in southeastern Washington State. The subject of this paper, the 618-9 Burial Ground, is located on the Hanford Site approximately 1.6 km (1 mi) west of the Columbia River, and a few miles north of Richland, Washington. Throughout Hanford Site history, prior to legislation regarding disposal of chemical waste products, some chemical waste byproducts were disposed via burial in trenches. One such trench was the 618-9 Burial Ground. This burial ground was suspected to contain approximately 19,000 L (5,000 gal) of uranium-contaminated organic solvent, disposed in standard 55-gal (208-L) metal drums. The waste was produced from research and development activities related to fuel reprocessing.

2620 (WHC-SA-2317) Liquid return from gas pressurization of grouted waste. Powell, W.J.; Benny, H.L. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 8p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. (CONF-940815-69: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015707. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to force pore liquids out of a simulated waste grout matrix using air pressure was measured. Specimens cured under various conditions were placed in a permeameter and subjected to increasing air pressure. The pressure was held constant for 24 hours and then stepped up until either liquid was released or 150 psi was reached. One specimen was taken to 190 psi with no liquid release. Permeability to simulated tank waste was then measured. Compressive strength was measured following these tests. This data is to assess the amount of fluid that might be released from grouted waste resulting from the buildup of radiolytically generated hydrogen and other gasses within the waste form matrix. A plot of the unconfined compressive strength versus breakthrough pressures identifies a region of "good" grout, which will resist liquid release.

2621 (WHC-SA-2337) Nondestructive Examination Equipment In the Hanford Site WRAP 1 and Retrieval Project. Keve, J.K.; Weber, J.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-92: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94018489. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Receiving and Processing Facility, Module 1 (WRAP-1) is currently under construction at the Hanford Nuclear Site in south-central Washington State. The facility is scheduled to begin operation in 1996. Its mission is to annually receive more than 6,800 55-gallon drums of both newly generated and retrieved contact-handled solid waste and prepare them for certification and disposal. WRAP 1, the Nondestructive Examination (NDE) System has two primary functions: To identify the presence or verify the absence of non-compliant materials in the un-manifested, retrieved drums, and to certify that all outgoing drums of TRU waste (newly generated and processed) are free of liquids and other non-compliant items. The Solid Waste Retrieval Facility, Phase 1 Project will unearth and recover the first 10,000 of 38,000 drums of suspect TRU waste buried between 1970 and 1985 for which no detailed contents manifests exist. Follow-on projects will recover the balance of the buried drums. To resolve safely issues about storing the newly unearthed drums, the containers and contents will be examined at the recovery site before the containers are placed in storage facilities.

2622 (WHC-SA-2393) Laboratory and field evaluation of the gas treatment approach for insitu remediation of chromate-contaminated soils. Thornton, E.C.; Jackson, R.L. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941124-5: 33. Hanford symposium on health and the environment: symposium on in-situ remediation—scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE94014118. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory scale soil treatment tests have been conducted as part of an effort to develop and implement an insitu chemical treatment approach to the remediation of chromate-contaminated soils through the use of reactive

gases. These tests involved three different soil samples that were contaminated with Cr(VI) at the 200 ppm level. Treatment of the contaminated soils was performed by passing 100 ppm and 2000 ppm concentrations of hydrogen sulfide in nitrogen through soil columns until a S:Cr mole ratio of 10:1 was achieved. The treated soils were then leached with groundwater or deionized water and analyzed to assess the extent of chromium immobilization. Test results indicate >90% immobilization of chromium and demonstrate that the treatment process is irreversible. Ongoing developmental efforts are being directed towards the demonstration and evaluation of the gas treatment approach in a field test at a chromate-contaminated site. Major planned activities associated with this demonstration include laboratory testing of waste site soil samples, design of the treatment system and injection/extraction well network, geotechnical and geochemical characterization of the test site, and identification and resolution of regulatory and safety requirements.

2623 (WHC-SA-2425) Waste drum fire tests. Bucci, H.M.; Greenhalgh, W.O.; Olson, W.W.; Zimmer, J.J. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9406161-4: Safety analysis working group workshop, Albuquerque, NM (United States), 8-10 Jun 1994). Order Number DE94013583. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive solid wastes containing combustible materials have been generated and stored in drums and boxes at U.S. Department of Energy (DOE) sites since the 1940's. Programs are currently underway to characterize, process, and package the post-1970 portion of these wastes for final disposal as low-level or transuranic (TRU) waste. As these programs mature and projects are defined, safety analysis reports and fire hazard analyses are required to assure the DOE of the safety of the planned activities. Review of literature and discussions with other DOE sites indicated a lack of available data regarding the behaviour and consequences of fires involving radioactive combustible wastes stored at DOE sites. In the past 2 years, Westinghouse Hanford Company (WHC) has been involved in two different waste drum fire tests. The first was performed by Lawrence Livermore National Laboratory (LLNL) in 1993 and was patterned after a flammable liquid pool fire. The second was performed by WHC at the Hanford Site as part of a building demolition burn. These scoping tests provide useful data for the development of more structured test plans. The paper summarizes the LLNL and WHC tests and their results.

2624 (WHC-SA-2433) Determination of total cyanide in Hanford Site high-level wastes. Winters, W.I. (Westinghouse Hanford Co., Richland, WA (United States)); Pool, K.H. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-53: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94014636. Source: OSTI; NTIS; INIS; GPO Dep.

Nickel ferrocyanide compounds ($\text{Na}_{2-x}\text{Cs}_x\text{NiFe}(\text{CN})_6$) were produced in a scavenging process to remove ^{137}Cs from Hanford Site single-shell tank waste supernates. Methods for determining total cyanide in Hanford Site high-level wastes are needed for the evaluation of potential exothermic reactions between cyanide and oxidizers such as nitrate and for safe storage, processing, and management of the wastes in compliance with regulatory requirements. Hanford

Site laboratory experience in determining cyanide in high-level wastes is summarized. Modifications were made to standard cyanide methods to permit improved handling of high-level waste samples and to eliminate interferences found in Hanford Site waste matrices. Interferences and associated procedure modifications caused by high nitrates/nitrite concentrations, insoluble nickel ferrocyanides, and organic complexants are described.

2625 (WHC-SA-2452) Starting up a new U.S. Department of Energy Analytical Laboratory at the Hanford site. Grabbe, R.R. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9406195-1: NORM 1994: American Chemical Society (ACS) northwest regional meeting, Anchorage, AK (United States), 16-18 Jun 1994). Order Number DE94014638. Source: OSTI; NTIS; INIS; GPO Dep.

A new analytical chemistry laboratory was constructed on the Hanford Site near Richland, Washington by the U.S. Department of Energy to provide radiochemistry, inorganic, and organic analytical services. The laboratory is staffed and operated by Westinghouse Hanford Company, the U.S. Department of Energy contractor of the government-owned contractor-operated site. The start-up process, after laboratory construction and analytical equipment installation, requires a safety analysis report, approved analytical procedures, training, a plant "readiness review" by Westinghouse Hanford Company, and final approval for start-up by the U.S. Department of Energy.

2626 (WHC-SA-2453) Waste Immobilization demonstration program for the Hanford Site's Mixed Waste Facility. Burbank, D.A.; Weingardt, K.M. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-46: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94014121. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an overview of the Waste Receiving and Processing facility, Module 2A> waste immobilization demonstration program, focusing on the cooperation between Hanford Site, commercial, and international participants. Important highlights of the development and demonstration activities is discussed from the standpoint of findings that have had significant impact on the evolution of the facility design. A brief description of the future direction of the program is presented, with emphasis on the key aspects of the technologies that call for further detailed investigation.

2627 (WHC-SA-2460) Creating a proper safety culture at the Hanford Site low- and high-level waste vitrification plant projects. Baide, D.G.; Herborn, D.I. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940815-26: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94013585. Source: OSTI; NTIS; INIS; GPO Dep.

The United States has been engaged in defense nuclear activities at the Hanford Site for the past 50 years. To date, no high-level waste and only 3,800 m³ of low-level waste have been processed for final disposal. By the anticipated

start of low-level waste processing operations in the year 2005, approximately 215,000 m³ of low-level waste will be in underground storage tanks (90% of the total tank waste in storage). Similarly, approximately 25,000 m³ of high-level waste will be in underground storage by the anticipated start of high-level waste processing operations in the year 2009 (10% of the total tank waste in storage).

2628 (WHC-SA-2505) Accelerated characterization of metal fuel stored in the Hanford K basins. Makenas, B.J. (Westinghouse Hanford Co., Richland, WA (United States)); Omberg, R.P.; Lawrence, L.A.; Marschman, S.C.; Abrefah, J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941207-16: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95004362. Source: OSTI; NTIS; INIS; GPO Dep.

Efforts are under way to gather data on the condition of the metal fuel and associated sludge stored in the water-filled Hanford K Basins. Most of the current data gathering activities are being performed in the basins without fuel movement. These techniques include a video survey of open storage canisters, determination of water/gas levels in sealed canisters, sampling of gas and water from sealed canisters (for chemical analysis) and measurement of sludge depth and sludge volume.

2629 (WHC-SA-2551) Treatment and disposal of high-level radioactive waste at the Hanford Site: The technical challenge. Wodrich, D.D.; Honeyman, J.O.; Wojtasek, R.D. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9408168-1: American Chemical Society symposium on scientific issues related to safety treatment of waste tanks; 208. American Chemical Society national meeting, Atlanta, GA (United States); Washington, DC (United States), 21-26 Aug 1994; 21-26 Aug Order Number DE95000460. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE) Hanford Site, located in southeastern Washington State, has the most diverse and largest amount of radioactive tank waste in the US. A Tank Waste Remediation System (TWRS) Program was established in 1991 to safely store, treat, and dispose of those wastes. This paper describes the technical challenge in conducting the TWRS Program that will take more than 30 years and cost tens of billions of dollars to complete.

2630 (WHC-SA-2569) Conceptual design and development of high-activity radioactive liquid packaging (summary). Riley, D.L.; McCoy, J.C.; Edwards, W.S. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9408124-9: Transportation management annual workshop, Rockville, MD (United States), 8-11 Aug 1994). Order Number DE94018154. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental remediation and disposal of US Department of Energy radioactive liquid waste require analytical support, characterization, process development, testing, demonstration, and stabilization. In support of these diverse activities, there is a need to transport varying quantities of Type B high-activity liquid (HAL). To date, except for quantities of 50 ml (1.7 oz), there has never been, a US, Nuclear Regulatory Commission-licensed liquid Type B package

available to support these remediation activities. In an effort to develop suitable packaging for large volumes of HAL, an investigation into packaging alternatives that would facilitate such transfers is under way. In past and present studies, a spent fuel shipping cask fitted with a high-integrity pressure vessel has been determined to be the most viable concept for large volume HAL shipments. One concept that was investigated utilized the Pacific Nuclear 125-B shipping container and has been shown to meet the structural, thermal, shielding, and criticality conditions for HAL. The results of these investigations are being extended to develop the concept into the HAL packaging system.

2631 (WHC-SA-2609) In situ characterization of metal fuel stored in the Hanford K Basins. Makenas, B.J.; Omberg, R.P.; Lawrence, L.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-32: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006885. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford K Basins contain roughly 2,000 tons of uranium metal fuel previously irradiated in N Reactor. Current plans call for the fuel to be moved to a new storage location in the next few years. This paper describes near term activities to gather data on the mechanical condition and chemical state of the fuel and associated sludge. These ongoing in-situ, nondestructive, examinations are intended to complement hot cell examinations which are planned for the near future. Characterization data will feed decisions on interim storage, long term storage and the environmental documentation process as the fuel is relocated. Several techniques have been, or are planned to be, employed during the conduct of examinations in the K Basins. (1) A video survey using underwater cameras has been made for the open top canisters which hold fuel in the K East Basin. These data have given early assessments of cladding degradation, canister corrosion, fuel swelling, and canister/fuel interactions; (2) Ultrasonic measurements of the water level in gas traps connected to sealed canisters have been used to provide indications of gas generation in or water leakage into the canisters; (3) Sampling of gas and water from closed canisters of fuel in the K West Basin will furnish indications of fuel corrosion, fission product release, and canister integrity and will guide choices of fuel to be retrieved for detailed hot cell examinations; (4) Depth measurements and qualitative properties assessments for the sludge on the floor of the basins and in the bottom of canisters have been made using underwater video techniques.

2632 (WHC-SA-2625) Development of major process improvements for decontamination of large, complex, highly radioactive mixed waste items at the Hanford Site T Plant. Johnson, W.L.; Veilleux, R.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-47: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007775. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the decontamination/treatment mission at the Hanford Site, Westinghouse Hanford Company, under contract to the US Department of Energy, conducts decontamination activities at the T Plant complex. Currently, the 221-T canyon High-Level Waste Decontamination Facility and the 2706-T Low-Level Waste Decontamination Facility

capabilities are limited because upgrades are needed. Major process improvements must be developed to decontaminate large, complex, highly radioactive mixed-waste items. At the T Plant complex, an engineering team process was used to project possible solid mixed-waste feed streams and develop a preconceptual system to decontaminate and treat the waste. Treatment objectives and benefits were identified. Selected technologies were reviewed and improvements required to implement a preconceptual system at T Plant were considered. Decontamination facility alternatives were discussed in conjunction with ongoing and future decontamination activities at the Hanford Site, including efforts to enhance overall decontamination operations and capabilities.

2633 (WHC-SA-2628) Overview of the spent nuclear fuel project at Hanford. Daily, J.L. (Dept. of Energy, Richland, WA (United States). Richland Operations Office); Fulton, J.C.; Gerber, E.W.; Culley, G.E. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-51: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007777. Source: OSTI; NTIS; INIS; GPO Dep.

The Spent Nuclear Fuel Project's mission at Hanford is to "Provide safe, economic and environmentally sound management of Hanford spent nuclear fuel in a manner which stages it to final disposition." The inventory of spent nuclear fuel (SNF) at the Hanford Site covers a wide variety of fuel types (production reactor to space reactor) in many facilities (reactor fuel basins to hot cells) at locations all over the Site. The 2,129 metric tons of Hanford SNF represents about 80% of the total US Department of Energy (DOE) inventory. About 98.5% of the Hanford SNF is 2,100 metric tons of metallic uranium production reactor fuel currently stored in the 1950s vintage K Basins in the 100 Area. This fuel has been slowly corroding, generating sludge and contaminating the basin water. This condition, coupled with aging facilities with seismic vulnerabilities, has been identified by several groups, including stakeholders, as being one of the most urgent safety and environmental concerns at the Hanford Site. As a direct result of these concerns, the Spent Nuclear Fuel Project was recently formed to address spent fuel issues at Hanford. The Project has developed the K Basins Path Forward to remove fuel from the basins and place it in dry interim storage. Alternatives that addressed the requirements were developed and analyzed. The result is a two-phased approach allowing the early removal of fuel from the K Basins followed by its stabilization and interim storage consistent with the national program.

2634 (WHC-SA-2772) A history of solid waste packaging at the Hanford Site. Duncan, D.R. (Westinghouse Hanford Co., Richland, WA (United States)); Weyns-Rollosson, D.L.; Pottmeyer, J.A.; Stratton, T.J. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-123: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008031. Source: OSTI; NTIS; INIS; GPO Dep.

Since the initiation of the defense materials product mission, a total of more than 600,000 m³ of radioactive solid waste has been stored or disposed at the US Department of Energy's (DOE) Hanford Site, located in southeastern Washington State. As the DOE complex prepares for its

increasing role in environmental restoration and waste remediation, the characterization of buried and retrievably stored waste will become increasingly important. Key to this characterization is an understanding of the standards and specifications to which waste was packaged; the regulations that mandated these standards and specifications; the practices used for handling and packaging different waste types; and the changes in these practices with time.

2635 (WHC-SD-CP-ES-165) Alternatives for the disposition of fuel stored in the PUREX facility. Enghusen, M.B.; Gore, D.B. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006882. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an evaluation of five alternatives for the disposition of 3.4 metric tons of irradiated fuel from PUREX to support facility turnover following deactivation. The alternatives for disposition of the fuel include transfer to the K Basins, transfer to T Plant, passivation and dry vault storage, and dissolution and underground tank storage. The five alternatives were compared and it was determined that the fuel should be transferred from PUREX to the K Basins where it would be placed into pool storage.

2636 (WHC-SD-CP-HC-005) Hazards classification determination for PUREX fuel transfer to K-Basins. Dodd, E.N. III. Westinghouse Hanford Co., Richland, WA (United States). 13 Apr 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010598. Source: OSTI; NTIS; INIS; GPO Dep.

The PUREX Plant presently contains 2.9 metric tons of an aluminum clad Single Pass Reactor (SPR) fuel which is stored under water in four open top buckets in the PUREX slug storage basin. The PUREX dissolver cells contain approximately 0.5 metric tons of zirconium clad N Reactor fuel which was inadvertently placed into the process cell during charging operations. The dissolver N reactor elements will be recovered from the process floors using new crane operated tools. When the fuel shipment(s) is scheduled, the cask cars will be positioned into the PUREX rail tunnel and the overhead door will be opened. All the SPR fuel will be loaded into two cask rail cars inside four casks. The N Reactor fuel will be loaded into a separate rail car inside two or three casks. The car loading is initiated by opening the rail car lid and removing the cask lids. Prior to loading the canisters of N Reactor fuel, the canisters will be refilled with water (as needed) and a lid will be installed. The baskets of SPR fuel or canisters of N Reactor fuel will then be loaded into the casks. The lids to the casks will then be reinstalled and the car lids closed. The rail cars will then be decontaminated as necessary. The cask cars will be shipped either in two shipments or a combined single shipment using the rail route between PUREX and the K Basins. At the basin, the cask car will be positioned in the loadout area. The cask car lid will be opened and a single cask moved into the loadout pit, which is a lowered section of the basin. The cask lid is removed while the cask is lower into the pit. The fuel is then removed from the cask and stored in the basin. The cask is then removed, the lid reinstalled during removal, and the cask replaced into the cask car. This document identifies the hazard classification of the Fuel Transfer from the PUREX facility to K-Basins.

2637 (WHC-SD-CP-PLN-028) PUREX low-level waste radionuclide characterization. Ellis, M.W.; LeBaron, G.J. Westinghouse Hanford Co., Richland, WA (United States). 16 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006849. Source: OSTI; NTIS; INIS; GPO Dep.

The PUREX low-level waste (LLW) radionuclide characterization document describes the methodology for the characterization of solid LLW and solid low-level mixed waste (MW) with the respect to radiological characteristics. This document only serves as an overview of the PUREX radionuclide characterization methodology and provides specific examples for how the radionuclide distribution is derived. It would be impractical to provide all background information in this document. If further clarification and background information is required, consult the PUREX Regulatory Compliance group files. This document applies to only that waste generated in or is the responsibility of the PUREX facilities. The US Department of Energy (DOE) establishes the requirements for radioactive solid waste in DOE Order 5820.2A Radioactive Waste Management. Chapters 2 and 3 from DOE Order 5820.2A requires that generators of solid wastes in the LLW categories and the radioactive mixed waste subcategories: (1) identify the major radionuclides in each solid waste matrix and (2) determine the radionuclide concentrations and waste classes of their solid wastes. In addition, the Order also requires each generator to carry out a compliance program that ensures the proper certification of the solid waste generated.

2638 (WHC-SD-CP-QAPP-016) 222-S laboratory quality assurance plan. Meznarich, H.K. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010198. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides quality assurance guidelines and quality control requirements for analytical services. This document is designed on the basis of Hanford Analytical Services Quality Assurance Plan (HASQAP) technical guidelines and is used for governing 222-S and 222-SA analytical and quality control activities. The 222-S Laboratory provides analytical services to various clients including, but not limited to, waste characterization for the Tank Waste Remediation Systems (TWRS), waste characterization for regulatory waste treatment, storage, and disposal (TSD), regulatory compliance samples, radiation screening, process samples, and TPA samples. A graded approach is applied on the level of sample custody, QC, data verification, and data reporting to meet the specific needs of the client.

2639 (WHC-SD-CP-TP-076) HGMF of 10-L solutions. Larkin, K.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Aug 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000501. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the activities associated with the High Gradient Magnetic Filtration (HGMF) of plutonium-bearing solutions (10-L). The 10-L solutions were received from Argonne National Laboratories in 1972, are highly acidic, and are considered unstable. The purpose of the testing is to show that HGMF is an applicable method of removing plutonium precipitates from solution. The plutonium then can be stored safely in a solid form.

2640 (WHC-SD-CP-TP-076-Rev.1) HGMF of 10-L solutions. Revision 1. Larkin, K.A. Westinghouse Hanford Co., Richland, WA (United States). 27 Apr 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011660. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the activities associated with the High Gradient Magnetic Filtration (HGMF) of plutonium-bearing solutions (10-L). The 10-L solutions were received from Argonne National Laboratories in 1972, are acidic, and are considered unstable. Tests on a HGMF were conducted in the 1980's for N-reactor. These tests suggested that this system would be useful for the removal of transuranic elements from solutions. The purpose of this testing activity is to show that HGMF is an applicable method of removing plutonium precipitates from solution.

2641 (WHC-SD-CP-TP-077) Precipitation of plutonium from acidic solutions using magnesium oxide. Jones, S.A. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000514. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium (IV) is only marginally soluble in alkaline solution. Precipitation of plutonium using sodium or potassium hydroxide to neutralize acidic solutions produces a gelatinous solid that is difficult to filter and an endpoint that is difficult to control. If the pH of the solution is too high, additional species precipitate producing an increased volume of solids separated. The use of magnesium oxide as a reagent has advantages. It is added as a solid (volume of liquid waste produced is minimized), the pH is self-limiting (pH does not exceed about 8.5), and the solids precipitated are more granular (larger particle size) than those produced using KOH or NaOH. Following precipitation, the raffinate is expected to meet criteria for disposal to tank farms. The solid will be heated in a furnace to dry it and convert any hydroxide salts to the oxide form. The material will be cooled in a desiccator. The material is expected to meet vault storage criteria.

2642 (WHC-SD-CP-TP-077-Rev.1) Precipitation of plutonium from acidic solutions using magnesium oxide. Jones, S.A. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005435. Source: OSTI; NTIS; INIS; GPO Dep.

Magnesium oxide will be used as a neutralizing agent for acidic plutonium-containing solutions. It is expected that as the magnesium oxide dissolves, the pH of the solution will rise, and plutonium will precipitate. The resulting solid will be tested for suitability to storage. The liquid is expected to contain plutonium levels that meet disposal limit requirements.

2643 (WHC-SD-CP-TP-079) Test procedure for anion exchange chromatography. Cooper, T.D. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003767. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium from stored nitrate solutions will be sorbed onto anion exchange resins and converted to storable plutonium dioxide. Useful information will be simultaneously gained on the thermal stability and ion exchange capacity of four commercially available anion exchange resins over several

years and under severe degradative conditions. This information will prove useful in predicting the safe and efficient lifetimes of these resins.

2644 (WHC-SD-CP-TP-080) Test procedure for cation exchange chromatography. Cooper, T.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Aug 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003770. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test plan is to demonstrate the synthesis of inorganic antimonate ion exchangers and compare their performance against the standard organic cation exchangers. Of particular interest is the degradation rate of both inorganic and organic cation exchangers. This degradation rate will be tracked by determining the ion exchange capacity and thermal stability as a function of time, radiation dose, and chemical reaction.

2645 (WHC-SD-EN-AP-093) Site characterization for the W-049H Project. Mitchell, R.M. Westinghouse Hanford Co., Richland, WA (United States). 25 Mar 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010672. Source: OSTI; NTIS; INIS; GPO Dep.

Objective is to field characterize and sample the soil along the proposed effluent line routes for Project W-049H in the 200 East and West Area; overall plan is to discontinue the disposal of contaminated liquids into the Hanford soil column. General requirements (health, safety; prerequisites) sampling and field activities, quality assurance and quality control are discussed. The information from sampling will be used to determine the need for changes in the proposed routes prior to pipeline construction.

2646 (WHC-SD-EN-RA-005) Qualitative risk assessment for 100-DR-1 source operable unit. Naiknimbalkar, N.M. Westinghouse Hanford Co., Richland, WA (United States). 14 Jul 1994. 374p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016234. Source: OSTI; NTIS; INIS; GPO Dep.

The Washington State Department of Ecology (Ecology), the US Environmental Protection Agency (EPA), and the US Department of Energy (DOE), signatories to the Hanford Federal Facility Agreement and Consent Order have developed the Hanford site Past-Practice Strategy to emphasize initiating and completing waste site cleanups with a bias for action. This strategy relies, in part, upon the use of a qualitative risk assessment (QRA) to assist in decision-making. The QRA is performed using the Hanford Site Baseline Risk Assessment Methodology (HSBRAM) as guidance (DOE-RL 1993a). The results will be used, along with other considerations, to make a recommendation for or against an interim remedial measure (IRM) at each high-priority waste site. The objective of conducting IRMs at Hanford, is to achieve cleanup and reduce risk in the shortest time possible and in a cost effective manner.

2647 (WHC-SD-EN-RPT-010) 618-10 Burial Ground USRADS radiological surveys. Wendling, M. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014125. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes and documents the results of the radiological surveys conducted from February 11 through February 17 and March 30, 1993 over the 618-10 Burial

Ground, Hanford Site, Richland, Washington. In addition, this report explains the survey methodology using the Ultrasonic Ranging and Data System (USRADS). The 618-10 Burial Ground radiological survey field task consisted of two activities: characterization of the specific background conditions and the radiological survey of the area. The radiological survey of the 618-10 Burial Ground, along with the background study, were conducted by Site Investigative Surveys Environmental Restoration Health Physics Organization of the Westinghouse Hanford Company. The survey methodology was based on utilization of the Ultrasonic Ranging and Data System (USRADS) for automated recording of the gross gamma radiation levels at or near six (6) inches and at three (3) feet from the surface soil.

2648 (WHC-SD-EN-RPT-011) 618-11 Burial Ground USRADS radiological surveys. Wendling, M.A. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014128. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes and documents the results of the radiological surveys conducted from February 4 through February 10, 1993 over the 618-11 Burial Ground, Hanford Site, Richland, Washington. In addition, this report explains the survey methodology using the Ultrasonic Ranging and Data System (USRADS). The 618-11 Burial Ground radiological survey field task consisted of two activities: characterization of the specific background conditions and the radiological survey of the area. The radiological survey of the 618-11 Burial Ground, along with the background study, were conducted by Site Investigative Surveys Environmental Restoration Health Physics Organization of the Westinghouse Hanford Company. The survey methodology was based on utilization of the Ultrasonic Ranging and Data System (USRADS) for automated recording of the gross gamma radiation levels at or near six (6) inches and at three (3) feet from the surface soil.

2649 (WHC-SD-EN-TI-241) Geophysical Investigation of 216-U-8 clay vitrified pipe transfer line, 200 West Area. Bergstrom, K.A. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004508. Source: OSTI; NTIS; INIS; GPO Dep.

Two geophysical surveys were conducted over a vitrified clay pipeline (VCP) that was used to transfer liquid radioactive waste from the 224-U Building to the 216-U-8 and 216-U-12 cribs. The objectives of the surveys were to locate the VCP in the northern site, locate the bends in the VCP in the southern site, and locate possible utilities or pipelines at both sites. Ground-penetrating radar (GPR) was the method chosen for the surveys. Electromagnetic induction (EMI) was also used at the southern site to map the extent of a possible pipeline. It is very difficult to detect most VCPs with GPR, however, excavation boundaries for the pipeline are often discernible. The VCP was not identified in the GPR data at the northern site. Its anticipated depth was 10-12 ft. The VCP at the southern site appears to be much shallower. The data suggest it may be 5 ft or less below the surface in places. The edges of the excavation from N100 to N190 are between E120 and E135 and were quite distinct in the data. However, the excavation boundaries weren't apparent north of N190, suggesting that the VCP bends to the north near N200. Several profiles were extended beyond

N200. These profiles detected a linear, with the characteristic signature of a pipeline, approximately 3 ft below the surface. There was no previous knowledge of the pipeline. The linear was traced across the entire surface contamination area with an EMI geophysical tool.

2650 (WHC-SD-EN-TI-268) 100 Area soil washing: Bench scale tests on 116-F-4 pluto crib soil. Field, J.G. Westinghouse Hanford Co., Richland, WA (United States). 10 Jun 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014270. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory conducted a bench-scale treatability study on a pluto crib soil sample from 100 Area of the Hanford Site. The objective of this study was to evaluate the use of physical separation (wet sieving), treatment processes (attrition scrubbing, and autogenous surface grinding), and chemical extraction methods as a means of separating radioactively-contaminated soil fractions from uncontaminated soil fractions. The soil washing treatability study was conducted on a soil sample from the 116-F-4 Pluto Crib that had been dug up as part of an excavation treatability study. Trace element analyses of this soil showed no elevated concentrations above typically uncontaminated soil background levels. Data on the distribution of radionuclide in various size fractions indicated that the soil-washing tests should be focused on the gravel and sand fractions of the 116-F-4 soil. The radionuclide data also showed that ¹³⁷Cs was the only contaminant in this soil that exceeded the test performance goal (TPG). Therefore, the effectiveness of subsequent soil-washing tests for 116-F-4 soil was evaluated on the basis of activity attenuation of ¹³⁷Cs in the gravel- and sand-size fractions.

2651 (WHC-SD-EN-TI-279) Summary of remedial investigations at the 307 retention basins and 307 trenches (316-3), 300-FF-2 Operable Unit. Hulstrom, L.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94015649. Source: OSTI; NTIS; INIS; GPO Dep.

Remedial investigations at the 307 retention basins and 307 trenches (316-3) in the 300 Area of the Hanford Site were conducted as part of the 300-FF-1 operable unit Phase 1 remedial investigation (RI) in accordance with the approved RI work plan. During the RI, the southwestern boundary of the 300-FF-1 operable unit was modified by all signatories to the Hanford Federal Facility Agreement and Consent Order, which shifted the 307 retention basins and 307 trenches to the 300-FF-3 operable unit. As a consequence, the RI results from these waste management units were not included in the Phase 1 Remedial Investigation Report for the 300-FF-1 Operable Unit. As a result of recent Hanford Federal Facility Agreement and Consent Order negotiations, the 300-FF-2 operable unit now consists of the remaining 300 Area operable units within the 300 Area National Priorities List (NPL), which includes the former 300-FF-3 operable unit. Therefore, this document summarizes the RI results from the 307 retention basins and 307 trenches in the 300-FF-2 operable unit. Analysis and evaluation of these results will be included in the 300-FF-2 RI report.

2652 (WHC-SD-EN-TI-285) Geophysical Investigation of trench 4, Burial Ground 218-W-4C, 200 west area. Kiesler, J.P. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 38p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94019010. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of a geophysical investigation conducted to characterize Trench 4, located in Burial Ground 218-W-4C, 200 West Area. Trench 4 is where transuranic (TRU) waste is stored. The primary objective of these geophysical investigations was to determine the outer edges of the trench/modules and select locations for plate-bearing tests. The test locations are to be 5 to 8 ft. beyond the edges of the trench. Secondary objectives include differentiating between the different types of waste containers within a given trench, determining the amount of soil cover over the waste containers, and to locate the module boundaries. Ground-penetrating radar (GPR) and electromagnetic induction (EMI) were the methods selected for this investigation.

2653 (WHC-SD-ER3641-ATP-003-Rev.1) Instrumentation acceptance test procedure for 244U DCRT. Koch, M.R.; Wiggins, D.D. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000342. Source: OSTI; NTIS; GPO Dep.

The attached Test Procedure provides detailed test steps to assure proper operation of the 244U DCRT instrumentation.

2654 (WHC-SD-FF-CSWL-00016-Rev.1) FSF trace heat limit file software. Revision 1. Anglesey, M.O. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002479. Source: OSTI; NTIS; INIS; GPO Dep.

Variable description list containing component identification and other information used by operating software. This file is modified or created by use of FFILER.COM. The variable description list contains: Component Identification: 9 character field; Description: 20 character field; First Drawing: 20 character field; Second Drawing: 20 character field; Terminal Board Number: 1 character field (values of 1 or 2); Terminal Board Slot & Conn #: 7 character field; Cell Number: 3 character field; Hi/Lo Limits: Integer numbers; Rate Limit: Integer numbers; Type of Inst.: J or K TC, coeff inst, off inst.; Offset: Offset for coefficient calculation; COEF: Multiplier to units for coefficient calc; Units: displayed UNITS.

2655 (WHC-SD-GN-SA-30006) Evaluation of near-field earthquake effects. Shrivastava, H.P. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002120. Source: OSTI; NTIS; INIS; GPO Dep.

Structures and equipment, which are qualified for the design basis earthquake (DBE) and have anchorage designed for the DBE loading, do not require an evaluation of the near-field earthquake (NFE) effects. However, safety class 1 acceleration sensitive equipment such as electrical relays must be evaluated for both NFE and DBE since they are known to malfunction when excited by high frequency seismic motions.

2656 (WHC-SD-GN-TA-30004) Minimum release survey requirements. Ellis, J.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-87RL10930. Order Number DE95003040. Source: OSTI; NTIS; INIS; GPO Dep.

This document documents the minimum release survey requirements for facilities at the Hanford site.

2657 (WHC-SD-HWV-UM-004-Rev.1) Activity Management System user reference manual. Revision 1. Gates, T.A.; Burdick, M.B. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1994. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000989. Source: OSTI; NTIS; INIS; GPO Dep.

The Activity Management System (AMS) was developed in response to the need for a simple-to-use, low-cost, user interface system for collecting and logging Hanford Waste Vitrification Plant Project (HWVP) activities. This system needed to run on user workstations and provide common user access to a database stored on a local network file server. Most important, users wanted a system that provided a management tool that supported their individual process for completing activities. Existing system treated the performer as a tool of the system. All AMS data is maintained in encrypted format. Users can feel confident that any activities they have entered into the database are private and that, as the originator, they retain sole control over who can see them. Once entered into the AMS database, the activities cannot be accessed by anyone other than the originator, the designated agent, or by authorized viewers who have been explicitly granted the right to look at specific activities by the originator. This user guide is intended to assist new AMS users in learning how to use the application and, after the initial learning process, will serve as an ongoing reference for experienced users in performing infrequently used functions. Online help screens provide reference to some of the key information in this manual. Additional help screens, encompassing all the applicable material in this manual, will be incorporated into future AMS revisions. A third, and most important, source of help is the AMS administrator(s). This guide describes the initial production version of AMS, which has been designated Revision 1.0.

2658 (WHC-SD-HWV-WP-005) Release of HWVP design media. Bevins, R.R. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002072. Source: OSTI; INIS; NTIS; GPO Dep.

Late in 1993 the Hanford Waste Vitrification Plant (HWVP) Project was given direction by the US Department of Energy (DOE), Richland Operations Office (RL) to defer design activities on the project. As a result of this direction, detailed design work on most structures was stopped and the design information was stored. Design and construction work was carried to completion on a few of the HWVP packages. The packages that were carried to completion are the subject of this work plan.

2659 (WHC-SD-NR-ANAL-014) Consolidated fuel decay heat calculations. Wittekind, W.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Jun 1994. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94017999. Source: OSTI; NTIS; INIS; GPO Dep.

The radiological decay heat generated from all irradiated fuel presently in K East (KE) and K West (KW) Basins was calculated in support of consolidated fuel storage. There are four sources of heat inflow into the fuel storage basins: (1)

radiological decay heat from irradiated fuel; (2) mechanical heat from operating machinery (e.g., pumps); (3) heat flow from surroundings (mainly the ground through the concrete walls into the basin water if it is maintained below ambient); and (4) exothermic chemical reactions of uranium oxidation (although at basin temperatures this reaction rate is slow). This report details the radiological decay heat from irradiated fuel source in the K basins. Decay heat calculations using ORIGEN2 (Wittekind 1994 and Schmittroth 1993) for irradiated fuel presently (April 1994) in KE and KW Basins gave results for January 31 of each year.

2660 (WHC-SD-NR-CSER-011-Rev.1) Criticality safety evaluation of the 100K Area ion exchange modules and ion exchange columns. Erickson, D.G. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003221. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety evaluation of the 100K Area ion exchange modules (IXM) and ion exchange columns (IXC) was completed to support operations without a criticality alarm system. The results show that the IXM's and IXC's are well below the criticality design limit of $k_{eff} = 0.95$ for normal and off-normal conditions.

2661 (WHC-SD-NR-CSER-013) Criticality safety evaluation for K Basins sandfilters. Wittekind, W.D. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001840. Source: OSTI; NTIS; INIS; GPO Dep.

Criticality safety for K Basins sandfilters was considered. No credible normal or off-normal scenarios were determined which could compromise criticality safety and result in a $k_{eff} \geq 0.98$. The conclusion is that, due to the physical form and isotopic distribution of the fissionable material, there is no possibility of a nuclear criticality in the sandfilter. For this reason, there is no need for a criticality alarm system for the K Basins sandfilters.

2662 (WHC-SD-NR-CSER-014-Rev.1) Criticality safety evaluation report for the 100 KE Basin sandfilter backwash pit. Erickson, D.G. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004753. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis presents the technical basis for establishing a safe mass limit for continued operations of the KE Basin sandfilter backwash pit. The main analysis is based on a very conservative UO_2 - PuO_2 - H_2O system using the measured isotopic concentrations of uranium and plutonium in the sludge. Appendix C contains analyses of the sandfilter backwash pit utilizing all verified materials presently in the pit, and gives new limits based on assumptions made.

2663 (WHC-SD-NR-CSER-015) Criticality safety evaluation report for MKIA fuel pertaining to consolidating fuel storage. Schwinkendorf, K.N. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003240. Source: OSTI; NTIS; INIS; GPO Dep.

Irradiated fuel criticality calculations are performed for MKIA fuel, 1.25 wt% ^{235}U , and 1.15 wt% ^{235}U fuel pieces and solutions. Comparisons are made between WIMS and MCNP. WIMS and MCNP calculations are documented.

2664 (WHC-SD-NR-ER-105) Consolidated fuel shielding calculations. Wittekind, W.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002110. Source: OSTI; NTIS; INIS; GPO Dep.

Irradiated fuel radiation dose rate and radiation shielding requirements are calculated using a validated ISOSHL-11 model. Comparisons are made to experimental measurements. ISOSHL-11 calculations are documented.

2665 (WHC-SD-PRP-HA-005) 222-S laboratory complex hazards assessment. Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 29 Aug 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000428. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Order 5500.3A, Emergency Planning and Preparedness for Operational Emergencies, requires that a facility specific hazards assessment be performed to support Emergency Planning activities. The Hazard Assessment establishes the technical basis for the Emergency Action Levels (EALs) and the Emergency Planning Zone (EPZ). Emergency Planning activities are provided under contract to DOE through the Westinghouse Hanford Company (WHC). This document represents the facility specific hazards assessment for the Hanford Site 222-S Laboratories. The primary mission of 222-S is to provide analytic chemistry support to the Waste Management, Chemical Processing, and Environmental programs at the Hanford Site.

2666 (WHC-SD-SNF-AP-001) Sealed canister liquid sampling for fuel characterization shipments. Trimble, D.J. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005630. Source: OSTI; NTIS; INIS; GPO Dep.

N-Reactor spent fuel elements will be removed from the sealed fuel storage canisters in the KW Basin and shipped to the 300 Area hot cells for characterization studies. Some of the canisters contain broken fuel elements exposing metallic uranium to the canister water. The exposed uranium surfaces have reacted with the water releasing fission product nuclides to the canister water. The extent of this release is unknown, but large radionuclide inventories could cause significant releases to the basin water. To avoid this, a method is needed to evaluate the magnitude of the canister water radioactivity to help make decisions about which canisters should not be opened for fuel sampling. The objective of this document is to provide a conceptual description of the process for obtaining and evaluating gas and liquid samples from KW fuel canisters in support of fuel characterization shipments. Also described are the decisions regarding the acceptability of a sample, the actions to be taken to obtain an acceptable sample, and the logical leading to decisions about opening canisters for fuel characterization sampling. This document will help guide a safety analysis of the liquid sampling process and the development of detailed procedures for the process. Outside the scope of this document are the processes for opening canisters, selecting fuel samples from opened canisters, shipping fuel samples, and closing canisters.

2667 (WHC-SD-SNF-DA-004) KE Basin monorail modification for the sludge removal and packaging

project. Orbeta, C.B. Westinghouse Hanford Co., Richland, WA (United States). 6 Feb 1995. 272p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007176. Source: OSTI; NTIS; INIS; GPO Dep.

The 105KE Basin currently stores over 1,100 metric tons of various N Reactor spent fuel in several canister forms, as well as several metric tons of sludge which must be removed. Modifications will consist of anchoring a permanent steel frame directly into the pit walls between existing columns and adding two travelling hoist rails, each capable of two directional motions. Each pit will have its own capability for targeting loads to any point inside the working areas of these pits. The structural frame designed for the monorail system at the Weasel and Tech-View pits was qualified as adequate for normal/operating loads, and dead plus live loads combined with seismic loads. The hoist operating live load is limited to 2,000 lb. The physical strength of the existing pit walls where the base plates are to be structurally anchored is unknown. The original structural drawings specified a minimum concrete strength of 3,000 lb/in². A pullout test should be performed to verify the strength of this concrete base. To reduce radiation exposure to levels as low as reasonably achievable (ALARA), installation and erection work inside the basin controlled area must be minimized; therefore, the pieces required for the modifications should be numbered in the fabrication shop, and erection should follow a procedure that corresponds to the assembly sequence indicated by the numbers. In conjunction with final erection, a mock-up activity should be conducted and base-plate locations verified to be within dimensional tolerances.

2668 (WHC-SD-SNF-DQO-001) Data quality objectives for the initial K West fuel examinations. Lawrence, L.A. (Westinghouse Hanford Co., Richland, WA (United States)); Thornton, T.A.; Abrefah, J. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007785. Source: OSTI; NTIS; INIS; GPO Dep.

The Data Quality Objectives (DQOs) were established for the examinations of the first group of fuel samples shipped from the K West Basin to the Hanford 327 Building hot cells for examinations to support the Path Forward recommended to solve the safety and environmental concerns associated with the deteriorating fuel in the K Basins. A separate DQO will be prepared for each future shipment of samples to the hot cells. The material stored in the K West Basin must ultimately be removed from the basin and placed in a stable storage configuration until it can be disposed of in a repository. The condition of the fuel in the closed canisters is a major uncertainty for any of the proposed actions. The major question to answer is what are the conditions of the materials in the closed canisters? The data to be gathered during the canister opening, handling, transport, associated hot cell handling, and examinations will also support decisions related to the Path Forward primarily in areas of transportation and the Multi-Canister Overpack (MCO) design.

2669 (WHC-SD-SNF-DQO-002) Data quality objectives for Ion Exchange Module (IXM) disposition. Choi, I. (Pacific Northwest Lab., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008473. Source: OSTI; NTIS; INIS; GPO Dep.

This Data Quality Objective (DQO) document presents the data needs and accuracy requirements for sampling ion exchange modules at the K Basins, 100 K Area, to determine if there is a hydrogen gas buildup within the modules. This document was produced by PNL, with the assistance of Neptune and Associates, and was partly funded (for facilitator) by DOE-HQ as a demonstration DQO for EM activities. PNL involved a number of PNL, WHC and support contract staff (including external technical consultants) in meetings to define the data needed, along with the necessary accuracy, to resolve issues associated with hydrogen accumulation in Ion Exchange Modules (IXMS) that were generated prior to July 1994 and only have one nuc-fil vent. IXMs generated after July 1994 have multiple nuc-fil vents and do not require sampling. PNL transmitted this DQO to WHC on January 31, 1995. This Supporting Document is to assure that the document is captured into the document retrieval system. WHC review focused on the acceptability of the technical conclusions such that the data collected will meet minimum operational, safety and environmental needs.

2670 (WHC-SD-SNF-DQO-003) Data quality objectives for gas and liquid samples from sealed K Basin canisters. Makenas, B.J. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008429. Source: OSTI; NTIS; INIS; GPO Dep.

Data Quality Objectives (DQOs) for gas and liquid sampling from the sealed canisters in K West Basin have been developed and are presented in this document. The scope of this document is limited primarily to the initial sampling effort. This sampling campaign either supports the selection of canisters to provide fuel for hotcell examinations, supports the demonstration of sampling equipment capabilities or provides an initial assessment of gas/liquid chemistry for comparison to the results of fuel element hotcell examinations. No sampling of canisters has occurred since 1983. It is proposed here that samples of gas and water be analyzed for constituents such as cesium, fission gases, and hydrogen which are markers for corrosion of uranium in a water environment. These data will allow an assessment of the risks involved when particular canisters are opened to retrieve fuel. This sampling campaign will also ensure that canisters with some failed fuel elements are included in the population that is opened for retrieval of fuel for hotcell examinations. Additionally, valuable correlations between the macroscopic visible condition of fuel, hotcell examinations, and the gases generated in canisters will be possible. The analysis of other chemical species in the gas and liquid will allow assessments of the performance of the previously added corrosion inhibitor and possibly assessments of radiolysis. Sampling of canisters will be performed with equipment that opens the valves in the canister lid and draws a 15 ml sample of either gas or water. This work will most likely be performed in one of the pits-associated with the K West Basin.

2671 (WHC-SD-SNF-DR-001) Design support document for the K Basins Vertical Fuel Handling Tools. Bridges, A.E. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008805. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the design support information for the Vertical Fuel Handling Tools, developed for the removal of N Reactor fuel elements from

their storage canisters in the K Basins storage pool and insertion into the Single Fuel Element Can for subsequent shipment to a Hot Cell for examination. Examination of these N Reactor fuel elements is part of the overall characterization effort. These new hand tools are required since previous fuel movement has involved grasping the fuel in a horizontal position. These tools are required to lift an element vertically from the storage canister. Additionally, a Mark II storage canister Lip Seal Protector was designed and fabricated for use during fuel retrieval. This device was required to prevent damage to the canister lip should a fuel element accidentally be dropped during its retrieval, using the handling tools. Supporting documentation for this device is included in this document.

2672 (WHC-SD-SNF-DRP-001) Design Reconstitution Program Plan and procedures for K Basins. Laney, T. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008035. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes a systematic program to establish, organize, and document the design basis and design requirement information for the K Basins where existing design information is inadequate. The Design Reconstitution Program involves identifying and retrieving design information from identified source documents; evaluating, verifying, and validating the design information; resolving discrepancies; regenerating missing critical design information; and preparing and issuing a summary document of the design information. Upon completion, the design requirements shall be evaluated with the facility as-found configuration to verify the adequacy of appropriate design requirements with the as-found configuration and to document and resolve any discovered discrepancies. Once the design requirement (design analysis, calculation, design basis) comparison is made and discrepancies resolved (disposed, implemented, and incorporated as required), the as-found condition of a drawing then becomes an as-built drawing that is released into the engineering release system. This as-built drawing is then the accurate accounting of the field configuration that is consistent with the design requirements (recovered through the design reconstitution program) and is used with high confidence to make valid engineering, operational, and maintenance decisions.

2673 (WHC-SD-SNF-ER-002) K-Basin Isolation barrier seal. Ruff, E.S. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003861. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents various aspects of the design, analysis, procurement, and fabrication of the hydraulic seal on the isolation barriers to be installed in the 100-K Area spent nuclear fuel basin. The isolation barrier is used to keep water in the basin in the event of an earthquake.

2674 (WHC-SD-SNF-ER-003) K-West and K-East basin thermal analyses for dry conditions. Beaver, T.R.; Cramer, E.R.; Hinman, C.A. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001557. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed 3 dimensional thermal analyses of the 100K East and 100 K West basins were conducted to determine the peak fuel temperature for intact fuel in the event of a complete loss of water from the basins. Thermal models for the building, an array of fuel encapsulation canisters on the basin floor, and the fuel within a single canister are described along with conservative predictions for the maximum expected temperatures for the loss of water event.

2675 (WHC-SD-SNF-ES-006) An assessment of KW Basin radionuclide activity when opening SNF canisters. Bergmann, D.W. (Westinghouse Hanford Co., Richland, WA (United States)); Moller, F.J.; Wray, J.L. Westinghouse Hanford Co., Richland, WA (United States); Moller, Engineering Corp., Los Gatos, CA (United States). 6 Feb 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007173. Source: OSTI; NTIS; INIS; GPO Dep.

N Reactor spent fuel is being stored in sealed canisters in the KW Basin. Some of the canisters contain damaged fuel elements. There is the potential for release of Cs 137, Kr 85, H3, and other fission products and transuranics (TRUs) when canisters are opened. Canister opening is required to select and transfer fuel elements to the 300 Area for examination as part of the Spent Nuclear Fuel (SNF) Characterization program. This report estimates the amount of radionuclides that can be released from Mark II spent nuclear fuel (SNF) canisters in KW Basin when canisters are opened for SNF fuel sampling as part of the SNF Characterization Program. The report also assesses the dose consequences of the releases and steps that can be taken to reduce the impacts of these releases.

2676 (WHC-SD-SNF-ES-007) K Basin sludge retrieval assay evaluation. Wootan, D.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Apr 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011548. Source: OSTI; NTIS; INIS; GPO Dep.

This study evaluated techniques for assaying the K Basin sludge during retrieval in either a batch or in-line mode for special nuclear material accountability, transportation, and storage requirements. Techniques evaluated include in-line chemical analysis, calorimetry, passive alpha spectroscopy, passive gamma ray spectroscopy, active gamma ray interrogation such as x-ray fluorescence and densitometry, passive neutron detection such as total and coincidence counting, and active neutron interrogation such as the californium shuffler and differential dieaway techniques.

2677 (WHC-SD-SNF-ES-008) K Basin sludge retrieval flocculant and material compatibility evaluation. Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). 12 Apr 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010740. Source: OSTI; NTIS; INIS; GPO Dep.

Constructed during the 1950's, the 105 K-East and 105 K-West storage basins were brought back into service to store irradiated N-Reactor fuel in 1975 and 1981, respectively. During the 15 to 20 years of fuel storage, a layer of "sludge" has settled to the bottom of the basins, pits, and spent fuel storage canisters. Activities related to the retrieving, processing and disposal of this sludge are underway. Two evaluations were performed: a flocculant evaluation to determine a compatible flocculant to aid infiltration and sludge

concentration and a material compatibility evaluation to recommend appropriate materials for the pumps, hoses, vacuum heads, and hydraulic fluids that will make up the sludge retrieval system.

2678 (WHC-SD-SNF-FDC-001) Gas and liquid sampling for closed canisters in K-West basins - functional design criteria. Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 27 Jul 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003253. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide functions and requirements for the design and fabrication of equipment for sampling closed canisters in the K-West basin. The samples will be used to help determine the state of the fuel elements in closed canisters. The characterization information obtained will support evaluation and development of processes required for safe storage and disposition of Spent Nuclear Fuel (SNF) materials.

2679 (WHC-SD-SNF-FDC-001-Rev.1) Gas and liquid sampling for closed canisters in the K-West Basin. Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 27 Jul 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005644. Source: OSTI; NTIS; INIS; GPO Dep.

Functional design criteria for a gas/liquid sampler for KW Basin.

2680 (WHC-SD-SNF-FDR-001) K-Basins Isolation barriers summary report. Marburger, D.C. Westinghouse Hanford Co., Richland, WA (United States). 27 Oct 1994. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003224. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to provide an information summary for the 100-K Area fuel storage basins design change. The design change was made to resolve an unresolved safety question related to potential water leakage from the basin following a design basis earthquake. The design change consists of installing isolation barriers in the K-East and K-West Basins. The barriers are installed in each basin to isolate the fuel storage portion of the basin from the location of the potential seismic induced leak. The summary represented by this report provides information on the issue, the courses of corrective action, the technical work to support the corrective action, and the fabrication, installation, testing of the isolation barriers.

2681 (WHC-SD-SNF-FRD-003) Functions and requirements for 105-KE Basin sludge retrieval and packaging. Feigenbutz, L.V. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005226. Source: OSTI; NTIS; INIS; GPO Dep.

Sludge, and the clouding due to sludge, interferes with basin operation and maintenance activities. This document defines the overall functions and requirements for sludge retrieval and packaging activities to be performed in the 105-KE Basin.

2682 (WHC-SD-SNF-FRD-005) 305 Building K basin mockup facility functions and requirements. Steele, R.M. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 4p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. Order Number DE95003049. Source: OSTI; NTIS; INIS; GPO Dep.

This document develops functions and requirements for installation and operation of a cold mockup test facility within the 305 Building. The test facility will emulate a portion of a typical spent nuclear fuel storage basin (e.g., 105-KE Basin) to support evaluation of equipment and processes for safe storage and disposition of the spent nuclear fuel currently within the K Basins.

2683 (WHC-SD-SNF-FRD-007) Functions and requirements for K Basin SNF characterization shipping. Bergmann, D.W. Westinghouse Hanford Co., Richland, WA (United States). 10 Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005632. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the plan for the shipping of fuel samples from the K Basins to the 300 Area for characterization. The fuel characterization project will evaluate the Hanford defense production fuel (N-Reactor and Single Pass Reactor) to support interim storage, transportation and final disposition. A limited number of fuel samples will be transported to a laboratory for analysis. It is currently estimated that 20 shipments of fuel per year for approximately 3 years (could be as long as 5 years) will be transported to the laboratory for analysis. Based on the NRC certificate of compliance each shipment is limited to 500 equivalent grams of ²³⁵U. In practical terms this will limit shipments to three outer elements or two assemblies of any type of N-Reactor or SPR fuel. Case by case determination of broken fuel will be made based on the type of fuel and maximum potential fissile content.

2684 (WHC-SD-SNF-HC-001) K Basins fuel encapsulation and storage hazard categorization. Porten, D.R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005642. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the initial hazard categorization for K-Basin fuel encapsulation and storage in the 100 K Area of the Hanford site. The Hazard Categorization for K-Basins addresses the potential for release of radioactive and non-radioactive hazardous material located in the K-Basins and their supporting facilities. The Hazard Categorization covers the hazards associated with normal K-Basin fuel storage and handling operations, fuel encapsulation, sludge encapsulation, and canister clean-up and disposal. The criteria categorizes a facility based on total curies per radionuclide located in the facility. Tables 5-3 and 5-4 display the results in section 5.0. In accordance with DOE-STD-1027 and the analysis provided in section 5.0, the K East Basin fuel encapsulation and storage activity and the K West Basin storage are classified as a "Category 2" Facility.

2685 (WHC-SD-SNF-HC-002-Rev.1) Hazard categorization of 100K East and 100K West in-basin fuel characterization program activities. Revision 1. Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008472. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a hazard categorization of the 105 K East and 105 K West in-basin activities associated with the fuel sampling and transport preparations. It is limited to

those characterization activities performed in the 105 KE and 105 KW fuel storage basin structures. The methodology of DOE standard DOE-STD-10227-92 is used. The report documents the determination that the in-basin activities associated with the fuel characterization program are classified as Hazard Category 3 (hazard analysis shows the potential for only significant localized consequences).

2686 (WHC-SD-SNF-PCP-001) 305 Building Cold Test Facility Management Plan. Whitehurst, R. Westinghouse Hanford Co., Richland, WA (United States). 3 Oct 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003050. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides direction for the conduct of business in Building 305 for cold testing tools and equipment. The Cold Test Facility represents a small portion of the overall building, and as such, the work instructions already implemented in the 305 Building will be utilized. Specific to the Cold Test there are three phases for the tools and equipment as follows: 1. Development and feature tests of sludge/fuel characterization equipment, fuel containerization equipment, and sludge containerization equipment to be used in K-Basin. 2. Functional and acceptance tests of all like equipment to be installed and operated in K-Basin. 3. Training and qualification of K-Basin Operators on equipment to be installed and operated in the Basin.

2687 (WHC-SD-SNF-PD-001) 105-KE basin pilot run relocation. Crystal, J.B. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002366. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to present the bases for selecting the exact in-facility location for installation of process equipment to support pilot testing activities in the 105-KE Basin at the United States Department of Energy Hanford Site, in southeastern Washington State. The 105-KE Basin was constructed during the early 1950s, as an integral component of the 105-K East reactor building. Similar basins were provided in all Hanford weapons production reactor buildings to receive fuel elements discharged from the reactors and stage them for rail transport to 200 Area fuel reprocessing plants. The 105-KE reactor began operation in 1955. It was shut down in 1971. However, the 105-KE Basin was reactivated several years later to store spent fuel from the N-Reactor basin and permit its continued operation during outages at the Plutonium Uranium Extraction (PUREX) plant in the 200E Area.

2688 (WHC-SD-SNF-PD-007) Schedule for final disposition of contaminated K-East basin water. Reuland, W.B. Westinghouse Hanford Co., Richland, WA (United States). 25 Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003225. Source: OSTI; NTIS; INIS; GPO Dep.

This document is to provide WHC's recommended schedule describing the activities for the final disposition of contaminated K-East basin water. The schedule will support the 100-KR-4 record of decision activities, and will meet the Tri-Party Agreement (TPA) milestone M-34-00-T04.

2689 (WHC-SD-SNF-PD-009) Spent nuclear fuel project integrated schedule plan. Squires, K.G. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995. 36p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95008875. Source: OSTI; NTIS; INIS; GPO Dep.

The Spent Nuclear Fuel Integrated Schedule Plan establishes the organizational responsibilities, rules for developing, maintain and status of the SNF integrated schedule, and an implementation plan for the integrated schedule. The mission of the SNFP on the Hanford site is to provide safe, economic, environmentally sound management of Hanford SNF in a manner which stages it to final disposition. This particularly involves K Basin fuel.

2690 (WHC-SD-SNF-PHA-001) Preliminary Hazards Analysis of K-Basin Fuel Encapsulation and Storage. Strickland, G.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Aug 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018506. Source: OSTI; NTIS; INIS; GPO Dep.

This Preliminary Hazards Analysis (PHA) systematically examines the K-Basin facilities and their supporting systems for hazards created by abnormal operating conditions and external events (e.g., earthquakes) which have the potential for causing undesirable consequences to the facility worker, the onsite individual, or the public. The operational activities examined are fuel encapsulation, fuel storage and cooling. Encapsulation of sludges in the basins is not examined. A team of individuals from Westinghouse produced a set of Hazards and Operability (HAZOP) tables documenting their examination of abnormal process conditions in the systems and activities examined in K-Basins. The purpose of this report is to reevaluate and update the HAZOP in the original Preliminary Hazard Analysis of K-Basin Fuel Encapsulation and Storage originally developed in 1991.

2691 (WHC-SD-SNF-PLN-001) Waste management plan for Hanford spent nuclear fuel characterization activities. Chastain, S.A. (Westinghouse Hanford Co., Richland, WA (United States)); Spinks, R.L. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002108. Source: OSTI; NTIS; INIS; GPO Dep.

A joint project was initiated between Westinghouse Hanford Company (WHC) and Pacific Northwest Laboratory (PNL) to address critical issues associated with the Spent Nuclear Fuel (SNF) stored at the Hanford Site. Recently, particular attention has been given to remediation of the SNF stored in the K Basins. A waste management plan (WMP) acceptable to both parties is required prior to the movement of selected material to the PNL facilities for examination. N Reactor and Single Pass Reactor (SPR) fuel has been stored for an extended period of time in the N Reactor, PUREX, K-East, and K-West Basins. Characterization plans call for transport of fuel material from the K Basins to the 327 Building Postirradiation Testing Laboratory (PTL) in the 300 Area for examination. However, PNL received a directive stating that no examination work will be started in PNL hot cell laboratories without an approved disposal route for all waste generated related to the activity. Thus, as part of the Characterization Program Management Plan for Hanford Spent Nuclear Fuel, a waste management plan which will ensure that wastes generated as a result of characterization activities conducted at PNL will be accepted by WHC for disposition is required. This document contains the details of the waste handling plan that utilizes, to the greatest extent possible, established waste handling and disposal practices at Hanford between PNL and WHC. Standard

practices are sufficient to provide for disposal of most of the waste materials, however, special consideration must be given to the remnants of spent nuclear fuel elements following examination. Fuel element remnants will be repackaged in an acceptable container such as the single element canister and returned to the K Basins for storage.

2692 (WHC-SD-SNF-PLN-004) Sampling and Analysis Plan for canister liquid and gas sampling at 105-KW fuel storage basin. Harris, R.A.; Green, M.A.; Makenas, B.J.; Trimble, D.J. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008428. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan (SAP) details the sampling and analyses to be performed on fuel canisters transferred to the Weasel Pit of the 105-KW fuel storage basin. The radionuclide content of the liquid and gas in the canisters must be evaluated to support the shipment of fuel elements to the 300 Area in support of the fuel characterization studies (Abrefah, et al. 1994, Trimble 1995). The following sections provide background information and a description of the facility under investigation, discuss the existing site conditions, present the constituents of concern, outline the purpose and scope of the investigation, outline the data quality objectives (DQO), provide analytical detection limit, precision, and accuracy requirements, and address other quality assurance (QA) issues.

2693 (WHC-SD-SNF-PMP-002) Project Management Plan 105-KE Basin sludge retrieval and packaging. McWethy, L.M. Westinghouse Hanford Co., Richland, WA (United States). 7 Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003777. Source: OSTI; NTIS; INIS; GPO Dep.

The KE Basin contains over 1,100 metric tons of spent nuclear fuel (SNF). The bulk of this inventory consists of over 50,000 zircaloy clad, uranium metal N-Reactor fuel element assemblies, along with less than half a metric ton of single-pass reactor fuel elements, stored in over 3,600 open top canister assemblies. In addition, sludge containing fissile and fission product material from damaged/degraded fuel has accumulated in the basin. The sludge, particularly the fines, impacts basin operations by clouding the water and making activities requiring a clear view impossible to complete until after sludge settles. Packaging would get the sludge out of the operator's way and allow it to be moved within the basin in a more manageable state. The primary project objective is to develop, procure, and qualify the equipment needed to remove all sludge from the KE Basin with minimal dose commitment, minimal cost, and on schedule. The project will provide: (1) the development, testing, and installation of equipment for sludge retrieval and packaging; (2) understanding of and experience with actual sludge through near-term sludge packaging feature tests in the KE Basin; (3) sludge removal and handling equipment required to support debris removal, fuel handling, and other activities involving sludge within the KE Basin; and (4) enlist industry expertise in all phases of the project. This Project Management Plan establishes the organizational responsibilities, control systems, and procedures for the execution of project activities for KE Basin sludge retrieval packaging, to meet programmatic requirements within authorized funding and approved schedules.

2694 (WHC-SD-SNF-PMP-008) IX Disposition Project - project management plan. Choi, I.G. Westinghouse Hanford Co., Richland, WA (United States). 8 Dec 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005083. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents plans for resolving saving and disposal concerns for ion exchange modules, cartridge filters and columns. This plan also documents the project baselines for schedules, cost, and technical information.

2695 (WHC-SD-SNF-PTR-001) Evaluation of storing Shippingport Core II spent blanket fuel assemblies in the T Plant PWR Core II fuel pool without active cooling. Gilbert, E.R. (Pacific Northwest Lab., Richland, WA (United States)); Lanning, D.D.; Dana, C.M.; Hedengren, D.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004788. Source: OSTI; NTIS; INIS; GPO Dep.

PWR Core II fuel pool chiller-off test was conducted because it appeared possible that acceptable pool-water temperatures could be maintained without operating the chillers, thus saving hundreds of thousands of dollars in maintenance and replacement costs. Test results showed that the water-cooling capability is no longer needed to maintain pool temperature below 38°C (100°F).

2696 (WHC-SD-SNF-RA-001) K Basin safety analysis. Porten, D.R.; Crowe, R.D. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005100. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this accident safety analysis is to document in detail, analyses whose results were reported in summary form in the K Basins Safety Analysis Report WHC-SD-SNF-SAR-001. The safety analysis addressed the potential for release of radioactive and non-radioactive hazardous material located in the K Basins and their supporting facilities. The safety analysis covers the hazards associated with normal K Basin fuel storage and handling operations, fuel encapsulation, sludge encapsulation, and canister clean-up and disposal. After a review of the Criticality Safety Evaluation of the K Basin activities, the following postulated events were evaluated: Crane failure and casks dropped into loadout pit; Design basis earthquake; Hypothetical loss of basin water accident analysis; Combustion of uranium fuel following dryout; Crane failure and cask dropped onto floor of transfer area; Spent ion exchange shipment for burial; Hydrogen deflagration in ion exchange modules and filters; Release of Chlorine; Power availability and reliability; and Ashfall.

2697 (WHC-SD-SNF-SARR-001) Review of consequences of uranium hydride formation in N-Reactor fuel elements stored in the K-Basins. Weber, J.W. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001598. Source: OSTI; NTIS; INIS; GPO Dep.

The 105-K Basins on the Hanford site are used to store uranium fuel elements and assemblies irradiated in and discharged from N Reactor. The storage cylinders in KW Basin are known to have some broken N reactor fuel elements in which the exposed uranium is slowly reacting chemically with water in the cylinder. The products of these reactions

are uranium oxide, hydrogen, and potentially some uranium hydride. The purpose of this report is to document the results of the latest review of potential, but highly unlikely accidents postulated to occur as closed cylinders containing N reactor fuel assemblies are opened under water in the KW basin and as a fuel assembly is raised from the basin in a shipping cask for transportation to the 327 Building for examination as part of the SNF Characterization Program. The postulated accidents reviews in this report are considered to bound all potential releases of radioactivity and hydrogen. These postulated accidents are: (1) opening and refill of a cylinder containing significant amounts of hydrogen and uranium hydride; and (2) draining of the single element can be used to keep the fuel element submerged in water after the cask containing the can and element is lifted from the KW Basin. Analysis shows the release of radioactivity to the site boundary is significantly less than that allowed by the K Basin Safety Evaluation. Analysis further shows there would be no damage to the K Basin structure nor would there be injury to personnel for credible events.

2698 (WHC-SD-SNF-SARR-002-Rev.2) Safety assessment of discharge chute isolation barrier preparation and installation. Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 21 Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005633. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis examines activities associated with the installation of isolation barriers in the K Basins at the Hanford Reservation. This revision adds evaluation of barrier drops on stored fuel and basin floor, identifies fuel which will be moved and addresses criticality issues with sludge. The safety assessment is made for the activities for the preparation and installation of the discharge chute isolation barriers. The safety assessment includes a hazard assessment and comparisons of potential accidents/events to those addressed by the current safety basis documentation. No significant hazards were identified. An evaluation against the USQ evaluation questions was made and the determination made that the activities do not represent a USQ. Hazard categorization techniques were used to provide a basis for readiness review classifications.

2699 (WHC-SD-SNF-SARR-002-Rev.3) Safety assessment of discharge chute isolation barrier preparation and installation activities. Revision 3. Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005292. Source: OSTI; NTIS; INIS; GPO Dep.

This revision adds a section addressing impacts of dropping surfacing tool and rack cutter on the basin floor, and corrects typographical errors. The safety assessment is made for the activities for the preparation and installation of the discharge chute isolation barriers. The safety assessment includes a hazard assessment and comparisons of potential accidents/events to those addressed by the current safety basis documentation. No significant hazards were identified. An evaluation against the USQ evaluation questions was made and the determination made that the activities do not represent a USQ. Hazard categorization techniques were used to provide a basis for readiness review classifications.

2700 (WHC-SD-SNF-SARR-003) Hydrogen production in the K-Basin ion exchange columns, modules and cartridge filters. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 184p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005622. Source: OSTI; NTIS; INIS; GPO Dep.

K-Basin uses ion exchange modules and ion exchange (IX) columns for removing radionuclides from the basin water. When the columns and modules are loaded, they are removed from service, drained and stored. After a few IX columns accumulate in storage, they are moved to a burial box. One of the burial box contains 33 columns and the other, six. The radionuclides act on the liquid left within and adhering to the beads to produce hydrogen. This report describes the generation rate, accumulation rate and significance of that accumulation. This summary also highlights those major areas of concern to the external (to Westinghouse Hanford Company [WHC]) reviewers. Appendix H presents the comments made by the external reviewers and, on a separate sheet, the responses to those comments. The concerns regarding the details of the analytical approach, are addressed in Appendix H and in the appropriate section.

2701 (WHC-SD-SNF-SARR-004) Results of falling barrier analyses. Fox, G.L. Westinghouse Hanford Co., Richland, WA (United States). 31 Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004494. Source: OSTI; NTIS; INIS; GPO Dep.

This document assesses the consequences if the isolation barrier plate is dropped and falls over on the fuel stored in the water-filled K-East basin. The water slows the rate of fall and some canister bending is expected but only a few rods, if any, would get crushed. The basin criticality calculations will not be affected.

2702 (WHC-SD-SNF-SD-002) Spent Nuclear Fuel Project technical baseline document. Volumes 1-4, FY 1994. Womack, J.C. Westinghouse Hanford Co., Richland, WA (United States). 3 Apr 1995. 864p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010097. Source: OSTI; NTIS; INIS; GPO Dep.

The Technical Baseline document presents the results of the SNFP systems engineering analyses to date. These analyses establish the baseline functions, requirements, and interfaces to a level necessary to complete the SNFP mission as defined in the SNFP Mission Analysis Report (Volume II). It is a summary-level description of the activities necessary to successfully complete the SNFP mission. The time relationship of these activities is depicted in a two page Activities Logic Diagram (Figure 1.0-1). This document lacks detail in some areas because a clear programmatic and technical path forward is currently under development, and several key trade studies are yet to be completed. A narrative baseline description has been provided as a basis for a point of departure for individual trade studies and further ANFP definition and development. This document is composed of four volumes. Volume I presents the SNFP baseline description. Volume II presents an updated version of the Mission Analysis Report. Volume III presents the results of the functions and requirements analyses, which is an update of the draft of the SNFP Functions and Requirements Document. The initial alternatives analyses are also included in this volume. Volume IV presents the supporting data for the first three volumes.

2703 (WHC-SD-SNF-SD-003-Vol.1) **Spent Nuclear Fuel Project technical baseline document. Fiscal year 1995: Volume 1, Baseline description.** Womack, J.C. (Westinghouse Hanford Co., Richland, WA (United States)); Cramond, R.; Paedon, R.J. Westinghouse Hanford Co., Richland, WA (United States). 13 Mar 1995. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009148. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a revision to WHC-SD-SNF-SD-002, and is issued to support the individual projects that make up the Spent Nuclear Fuel Project in the lower-tier functions, requirements, interfaces, and technical baseline items. It presents results of engineering analyses since Sept. 1994. The mission of the SNFP on the Hanford site is to provide safety, economic, environmentally sound management of Hanford SNF in a manner that stages it to final disposition. This particularly involves K Basin fuel, although other SNF is involved also.

2704 (WHC-SD-SNF-SM-001) **Spent nuclear fuel sampling strategy.** Bergmann, D.W. Westinghouse Hanford Co., Richland, WA (United States). 8 Feb 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007178. Source: OSTI; NTIS; INIS; GPO Dep.

This report proposes a strategy for sampling the spent nuclear fuel (SNF) stored in the 105-K Basins (105-K East and 105-K West). This strategy will support decisions concerning the path forward SNF disposition efforts in the following areas: (1) SNF isolation activities such as repackaging/overpacking to a newly constructed staging facility; (2) conditioning processes for fuel stabilization; and (3) interim storage options. This strategy was developed without following the Data Quality Objective (DQO) methodology. It is, however, intended to augment the SNF project DQOS. The SNF sampling is derived by evaluating the current storage condition of the SNF and the factors that effected SNF corrosion/degradation.

2705 (WHC-SD-SNF-SM-002) **Choices of canisters and elements for the first fuel shipment from K West Basin.** Makenas, B.J. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008806. Source: OSTI; NTIS; INIS; GPO Dep.

Twenty-two canisters (10 prime and 12 backup candidates) in the K West Basin have been identified as containing fuel which, when examined, will satisfy the Data Quality Objectives for the first fuel shipment from this basin. These were chosen as meeting criteria such as containing relatively long fuel elements, locking bar integrity, and the availability of gas/liquid interface level measurements for associated canister gas traps. Two canisters were identified as having reported broken fuel on initial loading. Usage and interpretation of canister cesium concentration measurements have also been established and levels of maximum and minimum acceptable cesium concentration (from a data optimization point of view) for decapping have been determined although other operational cesium limits may also apply. Criteria for picking particular elements, once a canister is opened, are reviewed in this document. A pristine, a slightly damaged, and a badly damaged element are desired. The latter includes elements with end caps removed but does not include elements which have large amounts of swelling or split cladding that might interfere with handling tools. Finally,

operational scenarios have been suggested to aid in the selections of canisters and elements in a way that utilizes anticipated canister gas sampling and leads to a correct and quick choice of elements which will supply the desired data.

2706 (WHC-SD-SNF-TA-002) **Unreviewed safety question evaluation of 100K East and 100K West in-basin fuel characterization program activities.** Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005645. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to provide the basis for answers to an Unreviewed Safety Question (USQ) safety evaluation of the 105K East (KE) and 105K West (KW) in-basin activities associated with the fuel characterization program as described in the characterization shipping plan. The significant activities that are common to both 105 KE and 105 KW basins are the movement of canisters from their main basin storage locations (or potentially from the 105 KE Tech View Pit if a dump table is available) to the south loadout pit transfer channel, hydrogen generation testing in the single element fuel container, loading the single element fuel container into the shipping cask, loading of the shipping cask onto a flat-bed trailer, return of the test fuel elements or element pieces from the 327 facility, placement of the fuel elements back into Mark 2 canisters, and placement of the canisters in the main storage basin. Decapping of canisters in the south loadout pit transfer channel and re-encapsulation of canisters are activities specific to the 105 KW basin. The scope of this safety evaluation includes only those characterization fuel shipment activities performed in the 105 KE and 105 KW fuel storage basin structures up to installation of the overpack. The packaging safety evaluation report governs the shipment of the fuel elements. The K Basins Plant Review Committee has determined that the in-basin activities associated with the fuel characterization program fuel shipments are bounded by the current safety envelop and do not constitute an unreviewed safety question. This determination is documented on Attachment 1.

2707 (WHC-SD-SNF-TA-003) **Unreviewed safety question evaluation of 100 K West fuel canister gas and liquid sampling.** Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005646. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to provide the basis for answers to an Unreviewed Safety Question (USQ) safety evaluation for the gas and liquid sampling activities associated with the fuel characterization program at the 100 K West (KW) fuel storage basin. The scope of this safety evaluation is limited to the movement of canisters between the main storage basin, weasel pit, and south loadout pit transfer channel (also known as the decapping station); gas and liquid sampling of fuel canisters in the weasel pit; mobile laboratory preliminary sample analysis in or near the 105 KW basin building; and the placement of sample containers in an approved shipping container. It was concluded that the activities and potential accident consequences associated with the gas and liquid sampling of 100 KW fuel canisters are bounded by the current safety basis documents and do not constitute an Unreviewed Safety Question.

2708 (WHC-SD-SNF-TA-004) OSR encapsulation basis - 100-KW. Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 27 Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006794. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to provide the basis for a change in the Operations Safety Requirement (OSR) encapsulated fuel storage requirements in the 105 KW fuel storage basin which will permit the handling and storing of encapsulated fuel in canisters which no longer have a water-free space in the top of the canister. The scope of this report is limited to providing the change from the perspective of the safety envelope (bases) of the Safety Analysis Report (SAR) and Operations Safety Requirements (OSR). It does not change the encapsulation process itself.

2709 (WHC-SD-SNF-TA-005) Safety evaluation - Spent water treatment system components inventory release. Dodd, E.N. Jr. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006793. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past few years various impediments to shipment of generated spent basin water treatment system components have resulted in the accumulation of quantities of these waste items at 100K. Specifically, there are (as of 01/01/95) 13 grout/culvert packaged cartridge filters (CF), four unpackaged cartridge filters, 60 spent ion exchange columns (IXC) and seven ion exchange modules (IXM) at 100K awaiting shipment for final waste disposal. As a result of the accumulation of this waste, the question has arisen regarding the consequences of potential releases of the inventory of radionuclides in these waste items relative to the K Area safety envelope. The purpose of this paper is to address this question. The initial step evaluating the consequences of potential release of material from the spent water treatment system components was to determine the individual and total radionuclide inventories of concern. Generally the radioisotopes of concern to the dose consequences were Sr/Y-90, Cs-137, and the transuranic (TRU) isotopes. The loading of these radioisotopes needed to be determined for each of the components of the total number of accumulated IXCs, IXMs and CFs. This evaluation examines four potential releases of material from the spent water treatment system components. These releases are: the release of material from all 39 IXCs stored in 183-KW; the release of material from the IXCs, IXMs and CFs at 105-KE and 105-KW; the release of material from the 13 CFs stored behind 105-KE; and the non-mechanistic release of the total stored waste inventory.

2710 (WHC-SD-SNF-TC-002) IXM gas sampling procedure. Pingel, L.A. Westinghouse Hanford Co., Richland, WA (United States). 3 Mar 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008891. Source: OSTI; NTIS; INIS; GPO Dep.

Ion Exchange Modules (IXMs) are used at the 105-KE and -KW Fuel Storage Basins to control radionuclide concentrations in the water. A potential safety concern relates to production of hydrogen gas by radiolysis of the water trapped in the ion exchange media of spent IXMs. This document provides a procedure for sampling the gases in the head space of the IXM.

2711 (WHC-SD-SNF-TI-002) Hanford Site existing irradiated fuel storage facilities description. Willis, W.L. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005463. Source: OSTI; NTIS; GPO Dep.

This document describes facilities at the Hanford Site which are currently storing spent nuclear fuels. The descriptions provide a basis for the no-action alternatives of ongoing and planned National Environmental Protection Act reviews.

2712 (WHC-SD-SNF-TI-004) Statistical evaluation of the data obtained from the K East Basin Sandfilter Backwash Pit samples. Welsh, T.L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 139p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000994. Source: OSTI; NTIS; INIS; GPO Dep.

Samples were obtained from different locations from the K East Sandfilter Backwash Pit to characterize the sludge material. These samples were analyzed chemically for elements, radionuclides, and residual compounds. The analytical results were statistically analyzed to determine the mean analyte content and the associated variability for each mean value.

2713 (WHC-SD-SNF-TI-010) 105-KW Sandfilter Backwash Pit sludge volume calculation. Dodd, E.N. Jr. Westinghouse Hanford Co., Richland, WA (United States). 10 Feb 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007783. Source: OSTI; NTIS; INIS; GPO Dep.

The volume of sludge contained in the 100-KW Sandfilter Backwash Pit (SFBWP) was calculated from depth measurements of the sludge, pit dimension measurements and analysis of video tape recordings taken by an underwater camera. The term sludge as used in this report is any combination of sand, sediment, or corrosion products visible in the SFBWP area. This work was performed to determine baseline volume for use in determination of quantities of uranium and plutonium deposited in the pit from sandfilter backwashes. The SFBWP has three areas where sludge is deposited: (1) the main pit floor, (2) the transfer channel floor, and (3) the surfaces and structures in the SFBWP. The depths of sludge and the uniformity of deposition varies significantly between these three areas. As a result, each of the areas was evaluated separately. The total volume of sludge determined was 3.75 M³ (132.2 ft³).

2714 (WHC-SD-SNF-TI-012) KE Basin underwater visual fuel survey. Pitner, A.L. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008833. Source: OSTI; NTIS; INIS; GPO Dep.

Results of an underwater video fuel survey in KE Basin using a high resolution camera system are presented. Quantitative and qualitative information on fuel degradation are given, and estimates of the total fraction of ruptured fuel elements are provided. Representative photographic illustrations showing the range of fuel conditions observed in the survey are included.

2715 (WHC-SD-SNF-TP-003) MAC mini acceptance test procedure, software Version 3.0. Russell, V.K. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 32p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95002148. Source: OSTI; NTIS; INIS; GPO Dep.

The K Basins Materials Accounting (MAC) programs had some major improvements made to it to organize the main- tables by Location, Canister, and Material. This ATP describes how the code was to be tested to verify its correctness.

2716 (WHC-SD-SNF-TP-004) MAC mini acceptance test procedures, software Version 3.3. Russell, V.K. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002147. Source: OSTI; NTIS; INIS; GPO Dep.

The K Basins Materials Accounting (MAC) programs had some improvements made to it to change slightly the access authorized users had to the modification of critical data. This ATP describes how the code was to be tested to verify its correctness.

2717 (WHC-SD-SNF-TP-007) Test plan, sludge retrieval, sludge packaging. Feigenbutz, L.V. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001531. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides direction for the cold testing of tools, equipment and systems which will be installed and operated in K-East (KE) Basin in support of the sludge retrieval and packaging project. The technical uncertainties related to the effectiveness of sludge retrieval procedures and equipment require that cold testing be completed before installation in KE Basin to identify and resolve existing problems, and to optimize the efficiency of all equipment and systems used. This plan establishes the responsibilities, test requirements, and documentation requirements necessary to complete cold tests of: (1) equipment with no potential for plant use; (2) prototype equipment and systems which may be upgraded for use in K-Basin; and (3) plant equipment and systems requiring cold acceptance testing prior to plant use. Some equipment and systems may have been subject to a formal design review and safety assessment; the results of which will be included as supporting documents to the operational readiness review (ORR).

2718 (WHC-SD-SNF-TP-008) Gas liquid sampling for closed canisters in KW Basin: Test plan. Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001558. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of the Spent Nuclear Fuel (SNF) sealed in canisters at KW-Basin is needed to determine the state of storing SNF wet. Samples of the liquid and the gas in the closed canisters will be taken to gain characterization information. Sampling equipment has been designed to retrieve gas and liquid from the closed canisters in KW Basin. This plan is written to outline the test requirements for this developmental sampling equipment.

2719 (WHC-SD-SNF-TP-008-Rev.1) Gas liquid sampling for closed canisters in KW Basin - test plan. Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006653. Source: OSTI; NTIS; INIS; GPO Dep.

Test procedures for the gas/liquid sampler. Characterization of the Spent Nuclear Fuel, SNF, sealed in canisters at KW-Basin is needed to determine the state of storing SNF wet. Samples of the liquid and the gas in the closed canisters will be taken to gain characterization information. Sampling equipment has been designed to retrieve gas and liquid from the closed canisters in KW basin. This plan is written to outline the test requirements for this developmental sampling equipment.

2720 (WHC-SD-SNF-TP-009) 105-KE/KW Isolation Barrier leak test specification and test plan. Arndt, T.E.; McCracken, K.J.; Papenfuss, J.N.; Whitehurst, R. Westinghouse Hanford Co., Richland, WA (United States). 28 Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003082. Source: OSTI; NTIS; INIS; GPO Dep.

This test specification/test plan establishes the organization responsibilities, plan and methodology for conducting the leak rate acceptance test of the K-East and K-West Isolation Barriers.

2721 (WHC-SD-SNF-TP-009-Rev.1) 105-KE/KW isolation barrier leak test specification/test plan. Revision 1. McCracken, K.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010056. Source: OSTI; NTIS; GPO Dep.

This supporting document uses an ECN to remove and replace pages in the 105-KE/KW test spec/test plan to clarify portions and correct administrative errors noted during recent reviews. No changes invalidate any safety or theory concerns.

2722 (WHC-SD-SNF-TP-010) Test plan for K-Basin fuel handling tools. Bridges, A.E. Westinghouse Hanford Co., Richland, WA (United States). 8 Feb 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007182. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the test plan and procedures for the acceptance testing of the handling tools enveloped for the removal of an N-Reactor fuel element from its storage canister in the K-Basins storage pool and insertion into the Single fuel Element Can for subsequent shipment to a Hot Cell for examination. Examination of these N-Reactor fuel elements is part of the overall characterization effort. New hand tools were required since previous fuel movement has involved grasping the fuel in a horizontal position. The 305 Building Cold Test Facility will be used to conduct the acceptance testing of the Fuel Handling Tools. Upon completion of this acceptance testing and any subsequent training of operators, the tools will be transferred to the 105 KW Basin for installation and use.

2723 (WHC-SD-SNF-TP-011) K-Basins debris removal equipment - test plan. Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008471. Source: OSTI; NTIS; INIS; GPO Dep.

An undetermined amount of debris remains in the K-Basins which must be removed. Due to the different types of debris that will be removed, a variety of tools will be required to complete this project. This test plan gives a broad scope of the requirements that will be used for testing equipment for K-Basin debris removal. The equipment tested will be

used in a radioactive environment. The equipment tested will be used to retrieve, cut, clean, and package debris from both K West and K East Basins. Testing is typically divided into six primary categories: development testing, acceptance testing, qualification testing, pre-operational testing, operational testing, and production/process testing.

2724 (WHC-SD-SNF-TP-012) 105 K-West Isolation barrier leak recovery plan. Wiborg, J.C. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008474. Source: OSTI; NTIS; INIS; GPO Dep.

Leak testing is being performed in 105 KW to verify the performance of the isolation barriers which have been recently installed. When an 11 inch differential head is established between the main basin and the discharge chute, a leak-rate of approximately 30 - 35 gpm is observed. The leak-rate would be achieved by a 1.65" - 2" diameter hole (or equivalent). Analyses suggest that the flow is turbulent/laminar transitional (dominantly turbulent), which would be indicative of a single point leak, typical of a pipe or large opening. However, local vortex rotation is observed in the entry to the West transfer chute while no observable motion was seen in the East transfer chute: this may be an indication of seal leakage in the East isolation barrier. The potential for leakage had been considered during the design and field work planning stages. Review of potential leak detection technologies had been made; at the planning stage it was determined that location specific leak detection could be established relatively quickly, applying existing K Basins technology (dye or ultrasonics). The decision was made not to pre-stage leak detection since the equipment development is highly dependent on the nature and location of the leak, and the characteristics of the leak rate provides data which guides leak characterization technology. The expense could be deferred and potentially avoided without risk to critical path activity. Consistent with the above, a systematic recovery plan has been developed utilizing phased activities to provide for management discipline combined with timely diagnosis and correction. Because this activity is not critical path at this time, activities will be coordinated with other plant activity to optimize overall plant work. Particular care will be exercised in assuring that information gained from this recovery can be utilized in the more critical work in 105 KE.

2725 (WHC-SD-SNF-TP-013) Test plan for K Basin Sludge Canister and Floor Sampling Device. Meling, T.A. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010145. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the test plan and procedure forms for conducting the functional and operational acceptance testing of the K Basin Sludge Canister and Floor Sampling Device(s). These samplers samples sludge off the floor of the 100K Basins and out of 100K fuel storage canisters.

2726 (WHC-SD-SNF-TRP-001) Cold test data for equipment acceptance into 105-KE Basin. Packer, M.J. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004151. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides acceptance testing of equipment to be installed in the 105-KE Basin for pumping sludge to support the discharge chute barrier doors installation.

2727 (WHC-SD-SNF-TRP-002) Gas/Liquid sampler for closed canisters in KW Basin - test report. Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007228. Source: OSTI; NTIS; INIS; GPO Dep.

Test report for the gas/liquid sampler designed and developed for sampling closed canisters in the KW Basin.

2728 (WHC-SD-SNF-TRP-003) Test reports for K Basins vertical fuel handling tools. Meling, T.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008802. Source: OSTI; NTIS; INIS; GPO Dep.

The vertical fuel handling tools, for moving N Reactor fuel elements, were tested in the 305 Building Cold Test Facility (CTF) in the 300 Area. After fabrication was complete, the tools were functionally tested in the CTF using simulated N Reactor fuel rods (inner and outer elements). The tools were successful in picking up the simulated N Reactor fuel rods. These tools were also load tested using a 62 pound dummy to test the structural integrity of each assembly. The tools passed each of these tests, based on the performance objectives. Finally, the tools were subjected to an operations acceptance test where K Basins Operations personnel operated the tool to determine its durability and usefulness. Operations personnel were satisfied with the tools. Identified open items included the absence of a float during testing, and documentation required prior to actual use of the tools in the 100 K fuel storage basin.

2729 (WHC-SD-SNF-TRP-004) Feature test report for the Small Debris Collection and Packaging System. Brisbin, S.A. Westinghouse Hanford Co., Richland, WA (United States). 17 Mar 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009094. Source: OSTI; NTIS; INIS; GPO Dep.

The Spent Nuclear Fuel Equipment Engineering group performed feature testing of the Small Debris Collection and Packaging System (SDCPS) in the 305 Cold Test Facility from January 30, 1995, to February 1, 1995. Feature testing of the Small Debris Collection and Packaging System (SDCPS) was performed for the following reasons: To assess the feasibility of using "drop-out" vessels to collect small debris (<2.5 cm) in MK-II fuel canisters while transferring sludge to the Weasel Pit. To evaluate system performance under conditions similar to those in the K-Basins (e.g. submerged under 4.9 meters of water and operated with long handled tools) while using a surrogate sludge mixed with debris. To determine if canister weight could be used to predict the volume of sludge and/or debris contained within the canisters during system operation.

2730 (WHC-SD-SNF-WP-001) 105-KE Basin Pilot Run design plan. Sherrell, D.L. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003054. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies all design deliverables and procedures applicable to the 105-KE Basin Pilot Run. It also establishes a general design strategy, defines interface control requirements, and covers planning for mechanical,

electrical, instrument/control system, and equipment installation design.

2731 (WHC-SD-SNF-WP-007) **Workplan, N-fuel canister slitter.** Griffin, T.E. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000435. Source: OSTI; NTIS; INIS; GPO Dep.

Previous segregation and repackaging operations involving removal of N-fuel elements resulted in fuel elements being stuck and unable to be removed from their canisters. This workplan describes the methods of development for slitting the walls of the three different types of canisters. Slitting the canister walls will allow the canister to expand and permit any stuck fuel elements to be removed from the canister. The Engineering Testing Laboratory (ETL) will develop and test a prototype canister slitter; evaluate existing slitter for usage or re-design; develop fabrication and assembly drawings; provide design calculations as required; and fabricate the canister slitter.

2732 (WHC-SD-SNF-WP-010) **Work plan for integrated sludge packaging demonstration.** Brisbin, S.A. Westinghouse Hanford Co., Richland, WA (United States). 7 Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003776. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the tasks which will be performed to support the hot demonstration of the integrated sludge packaging system to package the sludge that has accumulated in the KE Basin. This activity will be performed in three phases: Phase 1 will consist of testing component and sub-system performance using a surrogate sludge, Phase 2 will consist of cold testing the integrated sludge packaging system using a surrogate sludge, and Phase 3 will consist of the hot demonstration of the integrated sludge packaging system.

2733 (WHC-SD-SNF-WP-011) **Work plan for development of K-Basin fuel handling tools.** Bridges, A.E. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003855. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the engineering work plan for the development of handling tools for the removal of N-Reactor fuel elements from their storage canisters in the K-Basins storage pool and insertion into the Single Fuel Element Cans for subsequent shipment to a Hot Cell for examination. Examination of these N-Reactor fuel elements is part of the overall characterization effort. New hand tools are required since previous fuel movement has involved grasping the fuel in a horizontal position. These tools are required to lift an element from the storage canister.

2734 (WHC-SD-SNF-WP-012) **Gas and liquid sampling for closed canisters in KW Basin - Work Plan.** Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007225. Source: OSTI; NTIS; INIS; GPO Dep.

Work Plan for the design and fabrication of gas/liquid sampler for closed canister sampling in KW Basin. This document defines the tasks associated with the design, fabrication, assembly, and acceptance testing equipment

necessary for gas and liquid sampling of the Mark I and Mark II canisters in the K-West basin. The sampling of the gas space and the remaining liquid inside the closed canisters will be used to help understand any changes to the fuel elements and the canisters. Specifically, this work plan will define the scope of work and required task structure, list the technical requirements, describe design configuration control and verification methodologies, detail quality assurance requirements, and present a baseline estimate and schedule.

2735 (WHC-SD-SQA-CSA-20374) **CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T.** Chiao, T. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001644. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium Finish Plant (PFP) Engineering requested a criticality safety evaluation (Appendix 1) to support a revision of Criticality Prevention Specification CPS-Z-165-80601 allowing a plexiglass enclosure (PGE) to be placed inside the HC-227T hood as a contamination barrier. The HC-227T hood is the receiving/transfer enclosure for Pu nitrate solution contained in Product Removal containers (PR Cans), L10 Containers (L10, FI-10, 10 L) or L-3 Containers. Within the HC-227T, a 1.349 square meter (15 square foot) enclosure, PGE, has been created to provide contamination control around the weighing scale. Two or more standard criticality drains shall be installed on this enclosure prior to beneficial usage. The evaluation considered the normal process, spillage scenarios, waste/container accumulations within the enclosure, and interactions of Pu within the enclosure as well as other containers external to the enclosure. The results from the criticality safety analysis by CRA shows that such as contamination barrier can be placed inside the HC-227T Hood if the PGE is equipped with adequate criticality drains. In addition, other limits as well as administrative controls listed in CPS-Z-165-80601 Rev./Mod. B/0 and CPS-Z-165-80010 Rev./Mod. C/1 shall also apply.

2736 (WHC-SD-SQA-CSA-20376) **CSER 94-011: Use of glovebags for demister draining operations.** Hess, A.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005167. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety review is presented for the use of plastic-sheet glovebags for the operations of draining demisters on the 26-inch vacuum system headers. A criticality drain is required because of the possibility for spilling liquid of sufficient volume and fissile content for criticality. It is recommended that the glovebag design include a rigid, 2ft x 2ft floor with a central drain feeding a geometrically favorable spill-catch vessel, plus a screen grid above the bottom for drain protection.

2737 (WHC-SD-SQA-CSA-20377) **CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground.** Bhatia, S.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001637. Source: OSTI; NTIS; INIS; GPO Dep.

The restricted underground burial time of 20 years for galvanized drums and 18 years for painted drums was selected

based on structural integrity analysis and the application of conservative criticality safety principles because there is no established reliable real life behavior (corrosion) test data on such 55 gallon standard drums buried under the environmental conditions at Hanford. Efforts have been made to establish data to support the extension of the design life of these drums. The data so far obtained suggest a drum lifetime of twice the current restricted value, but the body of data is not enough to conclude this amount of time with certainty. This Criticality Safety Evaluation Report (CSER) Addendum establishes the technical basis for extending the underground storage time of only three drum sequences in the Hanford waste burial grounds which expire soon. The three drum sequences were originally scheduled for retrieval this year based on conservative assumptions about container lifetime in the burial ground. Evaluation of the recent retrieval data on physical contents of such containers and a corrosion study of the drums under the environmental conditions at Hanford burial grounds show that these drums can remain buried without loss of integrity much longer than the restricted storage time without posing any safety concern. Based on this review, it is concluded that a conditional approval of extending the underground storage time by 5 years beyond the expiration date(s) of these three placements is justified. This amendment will permit the Pilot Scale Retrieval operations of the buried drums for integrity inspection, drum material corrosion behavior, and inspection and repackaging of TRU waste currently underway at Hanford to proceed and to be in compliance with the applicable Criticality Prevention Specifications.

2738 (WHC-SD-SQA-CSA-20380) CSAR 79-034 AD-DENDUM 2, storing the man-basket in the process cell in 236-Z Building, Plutonium Finishing Plant/Plutonium Reclamation Facility. Chiao, T. Westinghouse Hanford Co., Richland, WA (United States). 25 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003169. Source: OSTI; NTIS; INIS; GPO Dep.

The man-basket is stored in the Plutonium Reclamation Facility canyon area and this addendum reports on a technical evaluation for the storage inside the canyon to ensure consistency with the requirements of the Nuclear Criticality Safety Manual, WHC-CM-4-29.

2739 (WHC-SD-SQA-CSA-20381) CSER 94-014: Storage of metal-fuel loaded EBR-II casks in concrete vault on PFP grounds. Hess, A.L. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004750. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety evaluation is presented to permit EBR-2 spent fuel casks loaded with metallic fuel rods to be stored in an 8-ft diameter, cylindrical concrete vault inside the PFP security perimeter. The specific transfer of three casks with Pu alloy fuel from the Los Alamos Molten Plutonium Reactor Experiment from the burial grounds to the vault is thus covered. Up to seven casks may be employed in the casing with 30 inches center to center spacing. Criticality safety is assured by definitive packaging rules which keep the fissile medium dry and at a low effective volumetric density.

2740 (WHC-SD-SQA-CSA-20382) CSER 79-028, Addendum 2: Security bar addition to pedestal storage racks in Room 3 in 2736-Z Building. Miller, E.M. Westinghouse Hanford Co., Richland, WA (United States). 18 Nov

1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004147. Source: OSTI; NTIS; INIS; GPO Dep.

The Plutonium Finishing Plant (PFP) is installing security bars on plutonium storage racks in Room 3 in 2736-Z Building to meet International Atomic Energy Agency (IAEA) material control requirements. Figures show the existing arrangement and design of the security bars. The security bars are to be fabricated of aluminum or carbon steel. The detailed fabrication sketches are reproduced in Appendix C. The security bars are to be installed close to the chains of plutonium so a determination of their effect on criticality safety needs to be made. The addition of security bars to the storage array of 2.5 kg plutonium buttons in Room 3 can effect reactivity by reflecting neutrons back into the plutonium in the storage cans, by absorbing neutrons, and by moderating neutrons between stored plutonium buttons. The small amount of metal added by the storage bars in comparison to the amount of concrete in the walls and aluminum in the shelf monitors already in place would not significantly increase the k_{eff} of the storage array. Several computer calculations in previous analyses show that the security bars will have a negligible affect on reactivity.

2741 (WHC-SD-SQA-CSA-20383) CSER 94-015: New portable NDA equipment for use in SNM audits. Hess, A.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005166. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety review is presented for the use of two portable NDA detectors from Los Alamos during an IAEA inspection of the SNM at PFP. The units are an Active Well Coincidence Counter (AWCC) and a High Level Neutron Coincidence Counter (HLNCC). Approval for their employment is based on the inherent safety of the containers to be assayed, one at a time, and because their designs conform with the acceptability criteria which allow the other NDA detectors currently employed at the facility.

2742 (WHC-SD-SQA-CSA-20384) Addendum 3 to CSAR 80-027, Use of calorimeter 109B for fissile material measurement. Chiao, T. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004491. Source: OSTI; NTIS; INIS; GPO Dep.

This modification to the Plutonium Finishing Plant (PFP) calorimeter system involves removing current calorimeter No. 3 from the water bath and replacing it with a calorimeter that can accommodate larger diameter items (an oversize can). The inside diameters of both the sample and the reference cells will be increased to 5.835 inches at the top opening and to 5.22 inches at the bottom, the 8 inch high measurement zone. This Addendum 3 to Criticality Safety Analysis Report 80-027 examines criticality safety during the use of the modified calorimeter (Calorimeter 109B) with enlarged cell tube diameters to assure that an adequate margin of subcriticality is maintained for all normal and contingency conditions.

2743 (WHC-SD-SQA-CSA-20387) Addendum 2 to CSER 79-002: Extension of the 150 gram fissile limit used in room 187 of PFP. Friar, D.E. Westinghouse Hanford Co., Richland, WA (United States). 13 Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95006827. Source: OSTI; NTIS; INIS; GPO Dep.

The PFP operating organization requests that the limit set permitting 150 grams fissile be extended to the Hoods 4 and 5 of Room 187. The request for the limit change is explained in the attached request for analysis.

2744 (WHC-SD-SQA-TA-20010-Rev.1) Technical assessment of compliance with work place air sampling requirements at T Plant. Revision No. 1. Hackworth, M.F. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007223. Source: OSTI; NTIS; INIS; GPO Dep.

The US DOE requires its contractors to conduct air sampling to detect and evaluate airborne radioactive material in the workplace. Hanford Reservation T Plant compliance with workplace air sampling requirements has been assessed. Requirements, basis for determining compliance and recommendations are included.

2745 (WHC-SD-SQA-TA-20015-Rev.1) Technical assessment of TRUSAF for compliance with work place air sampling. Revision 1. Butler, J.D. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006792. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Technical Work Document is to satisfy WHC-CM-1-6, the "WHC Radiological Control Manual." This first revision of the original Supporting Document covers the period from January 1, 1994 to December 31, 1994. WHC-CM-1-6 is the primary guidance for radiological control at Westinghouse Hanford Company (WHC). As such, it complies with Title 10, Part 835 of the Code of Federal Regulations. In addition to WHC-CM-1-6, there is HSRM-1, the "Hanford Site Radiological Control Manual" and several Department of Energy (DOE) Orders, national consensus standards, and reports that provide criteria, standards, and requirements for workplace air sampling programs. This document provides a summary of these, as they apply to WHC facility workplace air sampling programs. This document also provides an evaluation of the compliance of the TRUSAF workplace air sampling program to the criteria, standards, and requirements and documents. Where necessary, it also indicates changes needed to bring specific locations into compliance.

2746 (WHC-SD-TP-ANAL-002) CNS 1-13G Cask lid support frame structural analysis. Crow, S.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010144. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the structural analysis of the support frame for the Chem-Nuclear Systems (CNS) 1-13G Cask. The support frame will catch on underwater supports while the cask is being lowered into the pit, aiding in the removal of the cask lid in the load out chute in the K-Basins.

2747 (WHC-SD-TP-PDC-001-Rev.1) Packaging design criteria modified fuel spacer burial box: Revision 1. Stevens, P.F. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000439. Source: OSTI; NTIS; INIS; GPO Dep.

Various Hanford facilities must transfer large radioactively contaminated items to burial/storage. Presently, there are eighteen Fuel Spacer Burial Boxes (FSBBs) available on the Hanford Site for transport of such items. Previously, the FSBBs were transported from a rail car to the burial trench via a drag-off operation. To allow for the lifting of the boxes into the burial trench, it will be necessary to improve the packaging lifting attachments and provide structural reinforcement. Additional safety improvements to the packaging system will be provided by the addition of a positive closure system and package ventilation. FSBBs that are modified in such a manner are referred to as Modified Fuel Spacer Burial Boxes (MFSBs). The criteria provided by this PDC will be used to demonstrate that the transfer of the MFSB will provide an equivalent degree of safety as would be provided by a package meeting offsite transportation requirements. This fulfills the onsite transportation safety requirements implemented in WHC-CM-2-14, Hazardous Material Packaging and Shipping. A Safety Analysis Report for Packaging (SARP) will be prepared to evaluate the safety of the transfer operation. Approval of the SARP is required to authorize transfer. Criteria are also established to ensure burial requirements are met.

2748 (WHC-SD-TP-PDC-022) Packaging design criteria for the N Reactor/single pass reactor fuel characterization shipments. Stevens, P.F. Westinghouse Hanford Co., Richland, WA (United States). 31 Aug 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000506. Source: OSTI; NTIS; INIS; GPO Dep.

The majority of the spent fuel from the N Reactor and the single pass reactors (SPR) is presently being stored at the basins in the 100 K Area. Characterization of these fuels is essential to formulate a safe and efficient processing/disposal method for the spent fuel. Consequently, it is necessary to transport a cross section of spent fuel from the K Basins to the hot cells at the 327 Building in the 300 Area for analysis. The CNS 1-13G cask, a US Nuclear Regulatory Commission (NRC) certified cask manufactured by the ChemNuclear company, will be utilized for the transportation for irradiated fuel elements from the K Basins to the 327 Laboratories for characterization. The cask will utilize an inner container to compensate for the possibility of failed fuel cladding and to reduce the chances of contaminating the cask or the off loading facility. The Packaging Design Criteria (PDC) for these shipments establishes the acceptance criteria for the cask and for the design of an inner container that will be used in the Safety Evaluation for Packaging (SEP).

2749 (WHC-SD-TP-PDC-026) Packaging design criteria, transfer and disposal of 102-AP mixer pump. Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 23 Nov 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005165. Source: OSTI; NTIS; INIS; GPO Dep.

A mixer pump installed in storage tank 241-AP-102 (102-AP) has failed. This pump is referred to as the 102-AP mixer pump (APMP). The APMP will be removed from 102-AP 1 and a new pump will be installed. The main purpose of the Packaging Design Criteria (PDC) is to establish criteria necessary to design and fabricate a shipping container for the transfer and storage of the APMP from 102-AP. The PDC will be used as a guide to develop a Safety Evaluation for Packaging (SEP).

2750 (WHC-SD-TP-SEP-028) Safety Evaluation for Packaging for the N Reactor/single pass reactor fuel characterization shipments. Stevens, P.F. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002119. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Safety Evaluation for Packaging (SEP) is to authorize the ChemNuclear CNS 1-13G packaging to ship samples of irradiated fuel elements from the 100 K East and 100 K West basins to the Postirradiation Testing Laboratory (PTL) in support of the spent nuclear fuel characterization effort. It also authorizes the return of the fuel element samples to the 100 K East facility using the same packaging. The CNS 1-13G cask has been chosen to transport the fuel because it has a Certificate of Compliance (CoC) issued by the US Nuclear Regulatory Commission (NRC) for transporting irradiated oxide and metal fuel in commerce. It is capable of being loaded and offloaded underwater and may be shipped with water in the payload compartment.

2751 (WHC-SD-TP-SEP-030) Safety evaluation for packaging transfer of 101-AZ transfer pumps. Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 21 Mar 1995. 352p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010062. Source: OSTI; NTIS; INIS; GPO Dep.

Safety Evaluation for Packaging (SEP) provides evaluations and analysis considered necessary to approve a short-term onsite transfer campaign of transfer from the AZ tank to the Central Waste Complex (CWC). The SEP demonstrates the transfer will provide an equivalent degree of safety as would be provided by the transfer of similar packages meeting the US Department of Energy (DOE)/US Nuclear Regulatory Commission (NRC) requirements. This fulfills onsite transportation requirements implemented by WHC-CM-2-14, Hazardous Material Packaging and Shipping.

2752 (WHC-SD-TPWP-001) CNS 1-13G cask lid support work plan. Crow, S.R. Westinghouse Hanford Co., Richland, WA (United States). 17 Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008027. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan covers fabrication and load testing of one Chem-Nuclear Systems (CNS) 1-13G Cask lid Support Frame, per the attached drawing. The support frame is considered to be developmental equipment and as such may be fabricated in accordance with the engineering requirements and responsibilities identified in WHC-CM-6-1, Standard Engineering Practices, EP-2.4 Development Control Requirements. A final acceptance and load test is required by February 24, 1995. WHC will provide a released as-built drawing of the support frame by February 22, 1995 to allow final acceptance to occur prior to the completion date.

2753 (WHC-SD-W025-ATR-001-Rev.1) W-025, acceptance test report. Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004111. Source: OSTI; NTIS; INIS; GPO Dep.

This acceptance test report (ATR) has been prepared to establish the results of the field testing conducted on W-025

to demonstrate that the electrical/instrumentation systems functioned as intended by design. This is part of the RMW Land Disposal Facility.

2754 (WHC-SD-W026-OCD-001) One-trip drum operating instruction. Ruff, D.T. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001593. Source: OSTI; NTIS; INIS; GPO Dep.

The one trip system is a bagless transfer system for egress of waste from gloveboxes into 55 gallon one-trip drums. The contents of this document give an overview of the assembly, loading, and handling of the one-trip drum for use in the WRAP-1 plant.

2755 (WHC-SD-W026-SDD-001) WRAP Module 1 data management system (DMS) software design description (SDD). Talmage, P.A. Westinghouse Hanford Co., Richland, WA (United States). 17 Mar 1995. 317p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009114. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Receiving and Processing (WRAP) Module 1 Data Management System (DMS) System Design Description (SDD) describes the logical and physical architecture of the system. The WRAP 1 DMS SDD formally partitions the elements of the system described in the WRAP 1 DMS Software requirements specification into design objects and describes the key properties and relationships among the design objects and interfaces with external systems such as the WRAP Plant Control System (PCS). The WRAP 1 DMS SDD can be thought of as a detailed blueprint for implementation activities. The design descriptions contained within this document will describe, in detail, the software products that will be developed to assist the Project W-026, Waste Receiving and Processing Module 1, in their management functions. The WRAP 1 DMS is required to collect, store, and report data related to certification, tracking, packaging, repackaging, processing, and shipment of waste processed or stored at the WRAP 1 facility.

2756 (WHC-SD-W026-SDP-001) Waste receiving and processing facility module 1 data management system software project management plan. Clark, R.E. Westinghouse Hanford Co., Richland, WA (United States). 2 Nov 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004108. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the software development plan for the Waste Receiving and Processing (WRAP) Module 1 Data Management System (DMS). The DMS is one of the plant computer systems for the new WRAP 1 facility (Project W-026). The DMS will collect, store, and report data required to certify the low level waste (LLW) and transuranic (TRU) waste items processed at WRAP 1 as acceptable for shipment, storage, or disposal.

2757 (WHC-SD-W026-TI-006-Rev.1) Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1. Hinkle, A.W.; Jacobsen, P.H.; Lucas, D.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001838. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1, a 1991 Line Item, is planned for completion and start of operations in the spring of 1997. WRAP Module 1 will have the capability to characterize and repack age newly generated, retrieved and stored transuranic (TRU), TRU mixed, and suspect TRU waste for shipment to the Waste Isolation Pilot Plant (WIPP). In addition, the WRAP Facility Module 1 will have the capability to characterize low-level mixed waste for treatment in WRAP Module 2A. This report documents the assumptions and cost estimates for decontamination and clean-up of a maximum possible fire loss (MPFL) as defined by DOE Order 5480.7A, FIRE PROTECTION. The Order defines MPFL as the value of property, excluding land, within a fire area, unless a fire hazards analysis demonstrates a lesser (or greater) loss potential. This assumes failure of both automatic fire suppression systems and manual fire fighting efforts. Estimates were developed for demolition, disposal, decontamination, and rebuilding. Total costs were estimated to be approximately \$98M.

2758 (WHC-SD-W026-TI-009) Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1. Mayancsik, B.A. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 13 Oct 1994. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002071. Source: OSTI; NTIS; INIS; GPO Dep.

During the next two decades, the transuranic (TRU) waste now stored in the 200 Area burial trenches and storage buildings is to be retrieved, processed in the Waste Receiving and Processing (WRAP) Module 1 facility, and shipped to a final disposal facility. The purpose of this document is to identify the criteria that can be used to batch suspect TRU waste, currently in retrievable storage, for processing through the WRAP Module 1 facility. These criteria are then used to generate a batch plan for Phase 1 Retrieval operations, which will retrieve the waste located in Trench 4C-04 of the 200 West Area burial ground. The reasons for batching wastes for processing in WRAP Module 1 include reducing the exposure of workers and the environment to hazardous material and ionizing radiation; maximizing the efficiency of the retrieval, processing, and disposal processes by reducing costs, time, and space throughout the process; reducing analytical sampling and analysis; and reducing the amount of cleanup and decontamination between process runs. The criteria selected for batching the drums of retrieved waste entering WRAP Module 1 are based on the available records for the wastes sent to storage as well as knowledge of the processes that generated these wastes. The batching criteria identified in this document include the following: waste generator; type of process used to generate or package the waste; physical waste form; content of hazardous/dangerous chemicals in the waste; radiochemical type and quantity of waste; drum weight; and special waste types. These criteria were applied to the waste drums currently stored in Trench 4C-04. At least one batching scheme is shown for each of the criteria listed above.

2759 (WHC-SD-W059-FDC-002) Functional design criteria, Project W-059, B Plant Canyon ventilation upgrade. Roege, P.E. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC06-87RL10930. Order Number DE95008419. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the essential functions and requirements to be included in the design of the proposed B Plant canyon exhaust system upgrade. The project will provide a new exhaust air filter system and isolate the old filters from the airstream.

2760 (WHC-SD-W059-FHA-001) Preliminary Fire Hazards Analysis for W-059, B Plant canyon ventilation upgrade. Condrón, J.D.; Roege, P.E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010577. Source: OSTI; NTIS; INIS; GPO Dep.

This Preliminary Fire Hazards Analysis determines the fire hazards associated with the W-059, B Plant canyon ventilation upgrade project.

2761 (WHC-SD-W059-FRD-001-Rev.1) Functions and requirements, B Plant canyon ventilation upgrade: Revision 1. Roege, P.E. Westinghouse Hanford Co., Richland, WA (United States). 18 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000338. Source: OSTI; NTIS; GPO Dep.

This document outlines the essential functions and requirements to be included in the design of the proposed B Plant canyon exhaust system upgrade. The project will provide a new exhaust air filter system and isolate the old filters from the airstream.

2762 (WHC-SD-W087-FDC-001-Rev.3) Functional design criteria radioactive liquid waste line replacement, Project W-087. Revision 3. McVey, C.B. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003051. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the functional design criteria for the 222-S Laboratory radioactive waste drain piping and transfer pipeline replacement. The project will replace the radioactive waste drain piping from the hot cells in 222-S to the 219-S Waste Handling Facility and provide a new waste transfer route from 219-S to the 244-S Catch Station in Tank Farms.

2763 (WHC-SD-W087-PMP-001-Rev.1) Project management plan for Project 93L-EWW-087, "222-S radioactive liquid waste line replacement". Beyer, J.J. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005620. Source: OSTI; NTIS; INIS; GPO Dep.

Direct revision, to rev. 1, of the Project Management Plan for Project 93L-EWW-087, "222-S Radioactive Liquid Waste Line Replacement."

2764 (WHC-SD-W100-TI-009) Criticality classification of waste receiving and processing module 2A. Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005647. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to evaluate the criticality potential of the Waste Receiving and Processing Module 2A (WRAP 2A) and to demonstrate that the facility is an exempt

facility, under the provisions of the Nuclear Criticality Safety Manual. The WRAP 2A maximum potential transuranic (TRU) contents of feedstreams and product inventories are discussed. Total plant fissionable materials are estimated and compared with the fissionable material exempt quantity. The WRAP 2A operations and processes are also described, relative to the potential for concentrating or accumulating fissionable material within the facility.

2765 (WHC-SD-W113-ACDR-001) **Advanced conceptual design report solid waste retrieval facility, phase I, project W-113.** Smith, K.E. Westinghouse Hanford Co., Richland, WA (United States). 21 Mar 1994. 727p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018109. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-113 will provide the equipment and facilities necessary to retrieve suspect transuranic (TRU) waste from Trench 04 of the 218W-4C burial ground. As part of the retrieval process, waste drums will be assayed, overpacked, vented, head-gas sampled, and x-rayed prior to shipment to the Phase V storage facility in preparation for receipt at the Waste Receiving and Processing Facility (WRAP). Advanced Conceptual Design (ACD) studies focused on project items warranting further definition prior to Title I design and areas where the potential for cost savings existed. This ACD Report documents the studies performed during FY93 to optimize the equipment and facilities provided in relation to other SWOC facilities and to provide additional design information for Definitive Design.

2766 (WHC-SD-W-113-0CD-001) **Solid waste retrieval. Phase 1, Operational basis.** Johnson, D.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001533. Source: OSTI; NTIS; INIS; GPO Dep.

This Document describes the operational requirements, procedures, and options for execution of the retrieval of the waste containers placed in buried storage in Burial Ground 218W-4C, Trench 04 as TRU waste or suspect TRU waste under the activity levels defining this waste in effect at the time of placement. Trench 04 in Burial Ground 218W-4C is totally dedicated to storage of retrievable TRU waste containers or retrievable suspect TRU waste containers and has not been used for any other purpose.

2767 (WHC-SD-W221-DP-001) **[Phase 2, Solid Waste Retrieval Trench characterizations].** Johnson, D.M. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002360. Source: OSTI; NTIS; GPO Dep.

The abstract was presented in the form of illustrations regarding radioactive waste disposal trenches.

2768 (WHC-SD-W221-ES-002) **Phase 2, Solid waste retrieval strategy.** Johnson, D.M. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep. 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001540. Source: OSTI; NTIS; INIS; GPO Dep.

Solid TRU retrieval, Phase 1 is scheduled to commence operation in 1998 at 218W-4C-T01 and complete recovery of the waste containers in 2001. Phase 2 Retrieval will recover the remaining buried TRU waste to be retrieved and provide the preliminary characterization by non-destructive means to allow interim storage until processing for disposal.

This document reports on researching the characterization documents to determine the types of wastes to be retrieved and where located, waste configurations, conditions, and required methods for retrieval. Also included are discussions of wastes encompassed by Phase 2 for which there are valid reasons to not retrieve.

2769 (WHC-SD-W272-HC-001-Rev.1) **Special case waste hazard categorization. Revision 1.** Armstrong, D.L. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007221. Source: OSTI; NTIS; INIS; GPO Dep.

In this document, the hazard categorization is determined for activities associated with Project W-272, Special Case Waste (SWC) Storage Modules that will be placed on concrete slabs in the Solid Waste Operations Complex (SWOC) in the 200 West Area of the Hanford site. In this categorization, the activities that take place within the boundaries of the SWOC are addressed; therefore, only the receipt, off-loading, handling, and storing of the Special Case Waste at the SWOC are of concern. This revision updates the radioactive material inventory, reverses the assumption that the SCW meets the criteria of Packaging and Transportation of Radioactive Materials (10 CFR 71), Section 71.75, Qualification of Special Form Radioactive Material, and evaluates the project based upon the criteria and guidance provided by US Department of Energy (DOE)-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports. The Pacific Northwest Laboratory Building 324 B-Cell waste inventory consists of reactor fuel, irradiated fuel, fuel cladding, and vitrified forms of these fuel elements. The waste contains no toxic chemicals or hydrogenous materials. The proposed storage method is placement of the SCW in special waste overpacks (SWOs) that are then placed in a vendor-provided canister that is then placed in prefabricated, reinforced-concrete structures. These structures meet the requirements of Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste (10 CFR 72) and serve as a monitored retrievable storage (MRS) installation.

2770 (WHC-SD-W337-ATP-001) **Acceptance test procedure for the 340-NT-EX stack upgrades. Project W-337.** Hagerty, K.J. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004754. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an Acceptance Test Procedure (ATP) for the project W-337 upgrades to the 340-NT-EX stack, and its associated sampling and monitoring systems.

2771 (WHC-SD-W337-OTP-001) **Operability test procedure for the 340-NT-EX stack upgrades - Project W337.** Hagerty, K.J. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005284. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the 340-NT-EX sampling system upgrade Operability Test Procedure (OTP) is to test and ensure the sampler system upgrades correctly interface with the control room alarm and recording functions. The sampling system monitors the exhaust air from a 300 Area waste handling

facility for alpha, beta, gamma, particulate, and iodine releases.

2772 (WHC-SD-W405-CR-001) **Design criteria document, Fire Protection Task, K Basin Essential Systems Recovery, Project W-405.** Johnson, B.H. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005144. Source: OSTI; NTIS; INIS; GPO Dep.

The K Basins were constructed in the early 1950's with a 20 year design life. The K Basins are currently in their third design life and are serving as a near term storage facility for irradiated N Reactor fuel until an interim fuel storage solution can be implemented. In April 1994, Project W-405, K Basin Essential Systems Recovery, was established to address (among other things) the immediate fire protection needs of the 100K Area. A Fire Barrier Evaluation was performed for the wall between the active and inactive areas of the 105KE and 105KW buildings. This evaluation concludes that the wall is capable of being upgraded to provide an equivalent level of fire resistance as a qualified barrier having a fire resistance rating of 2 hours. The Fire Protection Task is one of four separate Tasks included within the scope of Project W405, K Basin Essential systems Recovery. The other three Tasks are the Water Distribution System Task, the Electrical System Task, and the Maintenance Shop/Support Facility Task. The purpose of Project W-405's Fire Protection Task is to correct Life Safety Code (NFPA 101) non-compliances and to provide fire protection features in Buildings 105KE, 105KW and 190KE that are essential for assuring the safe operation and storage of spent nuclear fuel at the 100K Area Facilities' Irradiated Fuel Storage Basins (K Basins).

2773 (WHC-SD-W405-PD-001) **Fire barrier evaluation of the wall between spent nuclear fuel storage basins and reactor areas, 105KE and 105KW.** Johnson, B.H. Westinghouse Hanford Co., Richland, WA (United States); Columbia Energy and Environmental Services, Inc., Richland, WA (United States). 24 Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003250. Source: OSTI; NTIS; INIS; GPO Dep.

This evaluation is intended to provide a comprehensive assessment of the risks from fire and fire related perils for the fire barriers between spent nuclear fuel storage basins and reactor areas, 105KE and 105KW. As a result of this fire barrier evaluation the present walls and the components thereof are not a true listed fire rated assembly. However, due to the construction of these barriers and the components thereof, these barriers will provide an equivalent level of protection provided the recommendations in Section 8.0 of this report are completed. These recommended upgrades are based upon sound engineering practice by a Registered Fire Protection Engineer. The construction of the barrier are substantial enough to provide the required 2-hr fire resistance rating. The primary concern is the numerous penetrations in the barrier. There are many penetrations that are adequate and no additional work is required. These penetrations are the ones that were poured-in-place at the time of construction. The penetrations that are of concern are some of the doors, the HVAC ducts, and the unsealed piping and conduit penetrations. There are several metal doors that should be replaced because the existing doors have either a non-approved window or louver that will not limit the spread of fire to one side of the barrier. All unsealed piping and conduit penetrations should be firestopped with an approved

firestopping material. The existing non-active ducts that pass through the barrier should be disconnected at the barrier and the opening sealed with an approved firestopping method.

2774 (WHC-SD-W405-PD-002) **Tech assist/fire safety assessment of 100K area facilities.** Johnson, B.H. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003232. Source: OSTI; NTIS; INIS; GPO Dep.

This Tech Assist/Fire Safety Assessment provides a comprehensive assessment of the 100K Area Facilities at the U.S. Department of Energy's Hanford Site for fire protection upgrades that may be needed given the limited remaining service life of these facilities. This assessment considers the relative nature of observed fire risks and whether the installed fire protection systems adequately control this risk. The analysis is based on compliance with DOE Orders, NFPA Codes and Standards, and recognized industry practice. Limited remaining service life (i.e., 6 to 12 years), current value of each facility, comparison to the best protected class of industrial risk, and the potential for exemptions from DOE requirements are key factors for recommendations presented in this report.

2775 (WHC-SD-WM-ANAL-037) **Sludge measurement results for 105 KE basin.** Meling, T.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003087. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe and analyze the results of sludge depth measurements that were conducted in the 105 K-East fuel storage basin. 262 sludge depth measurements were taken throughout the fuel storage basin and its remote pits. The mean sludge depth of the basin was calculated to be 5.33 centimeters (2.056 inches). The average of four individual analysis techniques yielded a volume of 48 cubic meters (1697 cubic feet).

2776 (WHC-SD-WM-ANAL-038) **Analysis of K-1 fan system for replacement of valve actuator, B Plant/Waste Encapsulation and Storage Facility.** Burgess, J.S. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005605. Source: OSTI; NTIS; INIS; GPO Dep.

Components of the K-1 fan system were evaluated for structural adequacy to accommodate an actuator weighing 540 lbs. The components evaluated were the connectors between the actuator and the valve, the duct between the valve and the facility wall, and the stud anchors connecting the duct to the facility wall. The loads were deadload, snow, operating loads, and seismic loads. The components were found to be structurally adequate for these loads.

2777 (WHC-SD-WM-AP-030-Rev.1) **Location of equipment in the 105K East discharge chute for installation of isolation barriers (ref USQ 94-0041): Revision 1.** Hull, T.R. Westinghouse Hanford Co., Richland, WA (United States). 4 Nov 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003840. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this report is to document the final location for equipment currently located in the 105 K-East discharge chute before beginning installation of the isolation barriers

and equipment that will/may be left after completion of installation. The isolation barriers are to be installed at each basin in the openings between the discharge chute and the main basin. Once installed, the isolation barriers will remain in place, permanently isolating the discharge chute from direct communication with the main basin. After the isolation barriers are installed, the equipment left in the discharge chute will not be able to be moved out of the chute without being totally removed from the water. The equipment that will be addressed by this Supporting Document includes: Crusher, Dump Table, Packager, Seal Conveyor, Old Cofferdam Doors, Joint Cover and Location Bars, Canister Basket, Air Operated Sludge Pump and Discharge Hose, Fuel Segregation Canister Table, Seal Preparation Tool, and Miscellaneous tools and equipment.

2778 (WHC-SD-WM-ATP-102) Acceptance test plan for the Waste Information Control System. Flynn, D.F. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001045. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the acceptance test plan for the WICS system. The Westinghouse Hanford Company (WHC) Hazardous Material Control Group (HMC) of the 222-S Laboratory has requested the development of a system to help resolve many of the difficulties associated with tracking and data collection of containers and drums of waste. This system has been identified as Waste Information and Control System (WICS). The request for developing and implementing WICS has been made to the Automation and Simulation Engineering Group (ASE).

2779 (WHC-SD-WM-ATP-103) Void fraction instrument acceptance test procedure. Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001514. Source: OSTI; NTIS; INIS; GPO Dep.

This acceptance test procedure (ATP) was written to test the void fraction instrument (VFI) and verify that the unit is ready for field service. The procedure verifies that the mechanical and electrical features (not specifically addressed in the software ATP) and software alarms are operating as designed.

2780 (WHC-SD-WM-ATP-105) Diesel generator trailer acceptance test procedure. Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000678. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) will document compliance with the requirements of WHC-S-0252 Rev. 1 and ECNs 609271, and 609272. The equipment being tested is a 150KW Diesel Generator mounted on a trailer with switchgear. The unit was purchased as a Design and Fabrication procurement activity. The ATP was written by the Seller and will be performed by the Seller with representatives of the Westinghouse Hanford Company witnessing the test at the Seller's location.

2781 (WHC-SD-WM-ATP-108) Acceptance test procedure for a portable, self-contained nitrogen supply. Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 11p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002116. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) will document compliance with the requirements of WHC-S-0249 Rev. 1 and ECN 606112. The equipment being tested is a Portable, Self-Contained Nitrogen Supply. The unit was purchased as a Design and Fabrication procurement activity. The Functional Test was written by the Seller and is contained in Appendix A. The Functional test will be performed by the Seller with representatives of the Westinghouse Hanford Company performing inspection and witnessing the functional test at the Seller's location.

2782 (WHC-SD-WM-ATP-110) Acceptance Test Procedure for the Link Belt Hook Position Monitor System. Aftanas, B.L. Westinghouse Hanford Co., Richland, WA (United States). 26 Oct 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003166. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) is for the Link Belt Hook Position Monitor System.

2783 (WHC-SD-WM-ATP-111) Rotary mode core sampling service trailer acceptance test plan. Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003081. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) will document compliance with the requirements of WHC-S-056 Rev. 2 and ECN 608798. The equipment being tested is a Furniture Type trailer with storage cabinets, lighting and HVAC systems installed. The unit was purchased as a Design and Fabrication procurement activity. The ATP was written by the Seller and will be performed by the Seller with representatives of the Westinghouse Hanford Company witnessing the test at the Seller's location.

2784 (WHC-SD-WM-ATP-111-Rev.1) Rotary mode core sampling service trailer Acceptance Test Plan. Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Nov 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004419. Source: OSTI; NTIS; GPO Dep.

This Acceptance Test Procedure (ATP) will document compliance with the requirements of specification WHC-S-056 Rev.2 including ECNs 608798 and 616386. The equipment being tested is a furniture type trailer with storage cabinets, lighting and HVAC systems installed. The unit was purchased as a Design and Fabrication procurement activity. The ATP be performed by representatives of the Westinghouse Hanford Company with the assistance of the Seller at the Seller's location.

2785 (WHC-SD-WM-ATP-114) 2707SX FACP replacement. Ferry, M.F. Westinghouse Hanford Co., Richland, WA (United States). 17 Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004159. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Fire Protection system functions as required by project criteria. This ATP will test the Pyrotropic CP-400 fire alarm control panel (FACP), and interfaces with

the radio fire alarm reporting box, alarm/supervisory initiating devices, and alarm indicating appliances. This document is to certify the installation of the fire alarm control panel and all attached devices to insure the Hanford Fire Dept. receives the proper signals. This particular fire alarm control panel services Bldg. 2707SX in the 200W Area of Hanford.

2786 (WHC-SD-WM-ATP-115) **242T FACP replacement.** Ferry, M.F. Westinghouse Hanford Co., Richland, WA (United States). 17 Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004155. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Fire Protection system functions as required by project criteria. This ATP will test the Pyrotropic CP-400 fire alarm control panel (FACP), and interfaces with the radio fire alarm reporting box, alarm/supervisory initiating devices, and alarm indicating appliances. This document is to certify the installation and testing of the fire alarm control panel and all attached devices to insure the Hanford Fire Dept. receives the proper signals. This fire alarm control panel is located in Bldg. 242T in the 200 W Area of Hanford.

2787 (WHC-SD-WM-ATP-117) **New supply for canyon fire foam system.** Gainey, T. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004429. Source: OSTI; NTIS; INIS; GPO Dep.

The raw water supply for the B-Plant Canyon fire foam system is being replaced. The 4 inch water supply line to the foam system is being rerouted from the 6 inches raw water line in the Pipe Gallery to the 10 inches raw water main in the Operating Gallery. This document states the acceptance criteria for the flushing and testing to be performed by the contractor.

2788 (WHC-SD-WM-ATR-089) **In situ viscometer instrument acceptance test report.** Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). 24 Aug 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018507. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of the acceptance test for the mechanical and electrical features (not specifically addressed by the software ATP) of the viscometer instrument. This document and the ATP satisfy the requirements in EP-4.1, "Design Verification Requirements." The selected mode of design verification is qualification testing. The testing described in this document verifies that the mechanical and electrical features are operating as designed and that the unit is ready for field service.

2789 (WHC-SD-WM-ATR-110) **Acceptance test report for the link belt LS-518 crane hook position/rate indication system.** Aftanas, B.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005224. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) is for the Link Belt LS-518 Crane Hook Position/Rate Indication System.

2790 (WHC-SD-WM-CM-002) **Configuration management plan for LABCORE Program.** Rich, H.S. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 26p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. Order Number DE95005638. Source: OSTI; NTIS; GPO Dep.

A hardware/software configuration management plan for LABCORE. LABCORE is a laboratory information management system used by Analytical Services.

2791 (WHC-SD-WM-CSD-004) **Criteria for cesium capsules to be shipped as special form radioactive material.** Lundeen, J.E. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001300. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to compile all the documentation which defines the criteria for Waste Encapsulation and Storage Facility (WESF) cesium capsules at the IOTEC facility and Applied Radiant Energy Corporation (ARECO) to be shipped as special form radioactive material in the Beneficial Uses Shipping System (BUSS) Cask. The capsules were originally approved as special form in 1975, but in 1988 the integrity of the capsules came into question. WHC developed the Pre-shipment Acceptance Test Criteria for capsules to meet in order to be shipped as special form material. The Department of Energy approved the criteria and directed WHC to ship the capsules at IOTEC and ARECO meeting this criteria to WHC as special form material.

2792 (WHC-SD-WM-CSRS-007-Rev.2) **Surveillance Analysis Computer System (SACS): Software requirements specification (SRS). Revision 2.** Glasscock, J.A. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008880. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the primary document establishing requirements for the Surveillance Analysis Computer System (SACS) database, an Impact Level 3Q system. SACS stores information on tank temperatures, surface levels, and interstitial liquid levels. This information is retrieved by the customer through a PC-based interface and is then available to a number of other software tools. The software requirements specification (SRS) describes the system requirements for the SACS Project, and follows the Standard Engineering Practices (WHC-CM-6-1), Software Practices (WHC-CM-3-10) and Quality Assurance (WHC-CM-4-2, QR 19.0) policies.

2793 (WHC-SD-WM-DP-067-Add.1A) **Analytical services: 222-S characterization of 242-A Evaporator Slurry, Campaign 94-1. Addendum 1A.** Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 372p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007413. Source: OSTI; NTIS; INIS; GPO Dep.

During the 242-A Evaporator's 94-1 campaign, five process samples were collected from the slurry stream for waste characterization. The five samples were collected over a 36 day time span, respectively on May 4, May 9, May 16, May 23, and June 9, 1994. Sample collections were performed per the protocol described in 242-A Evaporator Waste Analysis Plan, WHC-SD-WM-EV-060, Rev. 3 and in 242-A Evaporator Quality Assurance Project Plan, WHC-SD-WM-QAPP-009, Rev. 0. Slurry waste was characterized chemically and radiochemically by the Westinghouse Hanford Company, 222-S Laboratory as directed.

2794 (WHC-SD-WM-DTR-033) **Combustion and fuel loading characteristics of Hanford Site transuranic solid**

waste. Greenhalgh, W.O. Westinghouse Hanford Co., Richland, WA (United States). 8 Aug 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94017996. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Receiving and Processing (WRAP) Facility is being designed for construction in the north end of the Central Waste Complex. The WRAP Facility will receive, store, and process radioactive solid waste of both transuranic (TRU) and mixed waste (mixed radioactive-chemical waste) categories. Most of the waste is in 208-L (55-gal) steel drums. Other containers such as wood and steel boxes, and various sized drums will also be processed in the facility. The largest volume of waste and the type addressed in this report is TRU in 208-L (55-gal) drums that is scheduled to be processed in the Waste Receiving and Processing Facility Module 1 (WRAP 1). Half of the TRU waste processed by WRAP 1 is expected to be retrieved stored waste and the other half newly generated waste. Both the stored and new waste will be processed to certify it for permanent storage in the Waste Isolation Pilot Plant (WIPP) or disposal. The stored waste will go through a process of retrieval, examination, analysis, segregation, repackaging, relabeling, and documentation before certification and WIPP shipment. Newly generated waste should be much easier to process and certify. However, a substantial number of drums of both retrievable and newly generated waste will require temporary storage and handling in WRAP. Most of the TRU waste is combustible or has combustible components. Therefore, the presence of a substantial volume of drummed combustible waste raises concern about fire safety in WRAP and similar waste drum storage facilities. This report analyzes the fire related characteristics of the expected WRAP TRU waste stream.

2795 (WHC-SD-WM-ES-288) 224-T TRUSAF Building upgrade. Hodgson, R.D.; Sabin, J.C.; Lengas, G.C. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001567. Source: OSTI; NTIS; INIS; GPO Dep.

This study considers the upgrades that would be necessary to extend the life of the Transuranic Waste Storage and Assay Facility (TRUSAF) for an additional 30 years. The study also considers cleanup and conversion of the canyon area of the building for storage of solid waste. The 224-T Building was constructed in the 1940s to support process operations of the T-Plant. The function of the facility has changed over the years, and at present the northern half of the building is used to store solid waste. This portion of the building is referred to as the TRUSAF. TRUSAF is one of only two onsite facilities licensed to receive and store solid TRU wastes. Original intentions were for TRUSAF to be used for TRU solid waste storage until the WRAP 1 Facility became operational.

2796 (WHC-SD-WM-EV-060-Rev.4) 242-A Evaporator waste analysis plan: Revision 4. Basra, T.S.; Mulkey, C.H. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 30p. DOE Contract AC06-87RL10930. Order Number DE95001374. Source: OSTI; NTIS; INIS; GPO Dep.

This waste analysis plan (WAP) provides the plan for obtaining information needed for proper waste handling and processing in the 242-A Evaporator located on the Hanford Site. Regulatory and safety issues are addressed by establishing boundary conditions for waste received and treated

at the 242-A Evaporator. The boundary conditions are set by establishing limits for items such as potential exothermic reactions, waste compatibility, and control of vessel vent organic emissions. Boundary conditions are also set for operational considerations and to ensure waste acceptance at receiving facilities. The issues that are addressed in this plan include prevention of exotherms in the waste, waste compatibility, vessel vent emissions, and compatibility with the liner in the Liquid Effluent Retention Facility (LERF). The 242-A Evaporator feed stream is separated into two liquid streams: a concentrated slurry stream and a process condensate. A gaseous exhaust stream is also produced. The slurry contains the majority of the radionuclides and inorganic constituents. This stream is pumped back to the double shell tanks (DSTs) and stored for further treatment after being concentrated to target levels. The process condensate (PC) is primarily water that contains trace amounts of organic material and a greatly reduced concentration of radionuclides. The process condensate is presently stored in the (LERF) until it can be further processed in the Effluent Treatment Facility once it is operational.

2797 (WHC-SD-WM-FHA-003) Fire hazards analysis for the uranium oxide (UO₃) facility. Wyatt, D.M. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005138. Source: OSTI; NTIS; INIS; GPO Dep.

The Fire Hazards Analysis (FHA) documents the deactivation end-point status of the UO₃ complex fire hazards, fire protection and life safety systems. This FHA has been prepared for the Uranium Oxide Facility by Westinghouse Hanford Company in accordance with the criteria established in DOE 5480.7A, Fire Protection and RLID 5480.7, Fire Protection. The purpose of the Fire Hazards Analysis is to comprehensively and quantitatively assess the risk from a fire within individual fire areas in a Department of Energy facility so as to ascertain whether the objectives stated in DOE Order 5480.7, paragraph 4 are met. Particular attention has been paid to RLID 5480.7, Section 8.3, which specifies the criteria for deactivating fire protection in de-commission and demolition facilities.

2798 (WHC-SD-WM-IP-007) B Plant complex treatment, storage, and disposal units inspection plan. Beam, T.G. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003281. Source: OSTI; NTIS; INIS; GPO Dep.

Owners or operators of facilities that treat, store, and/or dispose of dangerous waste and/or mixed waste as defined by WAC 173-303, "Dangerous Waste Regulations," must inspect their facilities to prevent malfunctions and deteriorations, operator errors, and discharges that may cause or lead to the release of hazardous waste constituents to the environment and/or cause a threat to human health. The WAC regulations require a written inspection schedule be developed, implemented, and kept at the facility.

2799 (WHC-SD-WM-ISB-003) 340 Waste Handling Facility interim safety basis. Bendixsen, R.B. Westinghouse Hanford Co., Richland, WA (United States). 3 Apr 1995. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010041. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the interim safety basis (ISB) for the 340 Waste Handling Facility (340 Facility). An ISB is a documented safety basis that provides a justification for the continued operation of the facility until an upgraded final safety analysis report is prepared that complies with US Department of Energy (DOE) Order 5480.23, Nuclear Safety Analysis Reports. The ISB for the 340 Facility documents the current design and operation of the facility. The 340 Facility ISB (ISB-003) is based on a facility walkdown and review of the design and operation of the facility, as described in the existing safety documentation. The safety documents reviewed, to develop ISB-003, include the following: OSD-SW-153-0001, Operating Specification Document for the 340 Waste Handling Facility (WHC 1990); OSR-SW-152-00003, Operating Limits for the 340 Waste Handling Facility (WHC 1989); SD-RE-SAP-013, Safety Analysis Report for Packaging, Railroad Liquid Waste Tank Cars (Mercado 1993); SD-WM-TM-001, Safety Assessment Document for the 340 Waste Handling Facility (Berneski 1994a); SD-WM-SEL-016, 340 Facility Safety Equipment List (Berneski 1992); and 340 Complex Fire Hazard Analysis, Draft (Hughes Assoc. Inc. 1994).

2800 (WHC-SD-WM-MAR-004) Integrated dynamic modelling and management system mission analysis. Lee, A.K. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005103. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the mission analysis performed on the Integrated Dynamic Modeling and Management System (IDMMS). The IDMMS will be developed to provide the modeling and analysis capability required to understand the TWRS system behavior in terms of the identified TWRS performance measures. The IDMMS will be used to demonstrate in a verified and validated manner the satisfactory performance of the TWRS system configuration and assurance that the requirements have been satisfied.

2801 (WHC-SD-WM-OTP-170) Test plan for a U.S. Department of Transportation Specification 7A Type A radioactive material packaging, WHC Liquid Sample Package (unshielded) (3M SafeSend® Reusable Super Pack Shipping System [SP-R1L Kit]). Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005980. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this Test Plan is to describe the testing for certification of the 3M SafeSend container (SP-R1L, unshielded) as a US Department of Transportation Specification 7A Type A (DOT-7A) liquid package. The SafeSend SP-R1L is manufactured by the 3M Company and designed to be reusable up to eight times. The contents of the test units will be a polyethylene-coated glass bottle filled with carbon steel shot and water to simulate a liquid with a specific gravity of 2. The SafeSend SP-R1L, unshielded container, will consist of the "as-manufacture" package with a payload being a 1-liter (32-oz), polycoated, wide-mouth glass bottle with a Teflon-lined phenolic lid, and filled with the simulated contents as stated above. The packaging also includes six foam spacers and a cardboard shipper. Testing was conducted in September 1994. The packagings being tested are also intended for use in air transportation.

2802 (WHC-SD-WM-OTR-156) Operability test procedure for TRUSAF assayer software upgrade. Cejka, C.C. Westinghouse Hanford Co., Richland, WA (United States). 14 Feb 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010195. Source: OSTI; NTIS; INIS; GPO Dep.

This OTP is to be used to ensure the operability of the Transuranic Waste Assay System (TRUWAS). The system was upgraded and requires a retest to assure satisfactory operation. The upgrade consists of an AST 486 computer to replace the IBM-PC/XT, and a software upgrade (CNEUT). The software calculations are performed in the same manner as in the previous system (NEUT), however, the new software is written in C Assembly Language. CNEUT is easier to use and far more powerful than the previous program. The TRUWAS is used to verify the TRU content of waste packages sent for storage in the Transuranic Storage and Assay Facility (TRUSAF). The TRUSAF is part of Westinghouse Hanford's certification program for waste to be shipped to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The Transuranic Waste Assayer uses a combination passive-active neutron interrogation system to determine the TRU content of 55-gallon waste drums. The system consists of a shielded assay chamber; Deuterium-Tritium neutron generator; Helium-3 proportional counters; drum handling system; electronics including preamplifier, amplifier, and discriminator for each of the counter packages; and an AST 486 computer/printer system for data acquisition and analysis. The system can detect down to TRU levels of 10 nCi/g in the waste matrix. The equipment to be tested is: Assay Chamber Door Drum Turntable and Automatic Loading Platform Interlocks Assayer Software; and IBM computer/printer software. The objective of the test is to verify that the system is operational with the AST 486 computer, the software used in the new computer system correctly calculates TRU levels, and the new computer system is capable of storing and retrieving data.

2803 (WHC-SD-WM-PICD-002) Interface control document between PUREX/UO₃ Plant Transition and Solid Waste Disposal Division. Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94016434. Source: OSTI; NTIS; INIS; GPO Dep.

This interface control document (ICD) between PUREX/UO₃ Plant Transition (PPT) and Solid Waste Disposal Division (SWD) establishes at a top level the functional responsibilities of each division where interfaces exist between the two divisions. Since the PUREX Transition and Solid Waste Disposal divisions operate autonomously, it is important that each division has a clear understanding of the other division's expectations regarding these interfaces. This ICD primarily deals with solid wastes generated by the PPT. In addition to delineating functional responsibilities, the ICD includes a baseline description of those wastes that will require management as part of the interface between the divisions. The baseline description of wastes includes waste volumes and timing for use in planning the proper waste management capabilities: the primary purpose of this ICD is to ensure defensibility of expected waste stream volumes and Characteristics for future waste management facilities. Waste descriptions must be as complete as possible to ensure adequate treatment, storage, and disposal capability will exist. The ICD also facilitates integration of existing or planned waste management capabilities of the PUREX.

Transition and Solid Waste Disposal divisions. The ICD does not impact or affect the existing processes or procedures for shipping, packaging, or approval for shipping wastes by generators to the Solid Waste Division.

2804 (WHC-SD-WM-PLN-055-Rev.2) Fiscal year 1995 work scope for the 222-S, WSCF, 325, and Litco Laboratories. Thomas, C.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005636. Source: OSTI; NTIS; INIS; GPO Dep.

This report is intended to establish a baseline for the sample analyses to be completed by the 222-S, WSCF, 325, and LITCO laboratories during FY 1995. These analyses are intended to support the Hanford Environmental Restoration. The work covered by this report focuses on 5 Sample Categories (Environmental Remediation, Liquid Effluents, Solid Waste, TWRS, and Process Support).

2805 (WHC-SD-WM-PMP-014) LABCORE post release 1.0 development system project management plan. Rich, H.S. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001411. Source: OSTI; NTIS; INIS; GPO Dep.

The LABCORE post release 1.0 development system project management plan (SPMP) is the primary planning document governing the development of specific enhancements to the LABCORE project. The mission of the Westinghouse Hanford Company (WHC) laboratories is changing from supporting the 200 Area chemical processing plants for process control, waste management, and effluent monitoring to supporting environmental restoration and regulatory compliance commitments. The LABCORE program was implemented as the key element for meeting the commitments by upgrading the laboratories through the implementation of an Automated Data Processing improvement program in January 1994. Scope for LABCORE release 1.0 consisted of hardware and software implementation required to support a minimum number of analyses (Single-Shell Tank [SST] analysis at 222S Laboratory and Performance Evaluation samples at the Waste Sampling Characterization Facility laboratory) using manual entry of data, and to support routine laboratory functions, common to all laboratories. LABCORE post release 1.0 enhancements will expand the functionality presented to the laboratory. Post release 1.0 enhancements will also address the integration of a database for Analytical Services Program Integration, budgeting, and scheduling offices into LABCORE.

2806 (WHC-SD-WM-PROC-009-Rev.1) B Plant Complex generator dangerous waste storage areas inspection plan: Revision 1. Beam, T.G. Westinghouse Hanford Co., Richland, WA (United States). 3 Nov 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003841. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the inspection plan for the <90 day dangerous/mixed waste storage areas and satellite accumulation areas at B Plant Complex. This inspection plan is designed to comply with all applicable federal, state and US Department of Energy-Richland Operations Office training requirements. In particular, the requirements of WAC 173-303 "Dangerous Waste Regulations" are met by this inspection plan. This inspection plan is designed to provide B

Plant Complex with the records and documentation showing that the waste storage and handling program is in compliance with applicable regulations. The plan also includes the requirements for becoming a qualified inspector of waste storage areas and the responsibilities of various individuals and groups at B Plant Complex.

2807 (WHC-SD-WM-PRS-014) B Plant cleanout and stabilization program update. Gehrke, J.W. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001435. Source: OSTI; NTIS; INIS; GPO Dep.

The B Plant Cleanout and Stabilization Program Update FY1993 committed to an annual update document. The Cleanout and Stabilization Program (CSP) plan, Reference 1, remains as the best source of detailed discussion of CSP work and continues to be valid. The CSP presented a five year plan that left a number of plant systems operational to support WESF (Waste Encapsulation and Storage Facility) capsule storage. It is now apparent that the transition of B Plant to a long-term surveillance and maintenance mode (LTS and M) will be necessary to complete B Plant deactivation. To accomplish the LTS and M mode for B Plant, WESF will need to be physically isolated to allow stand alone operation for many years beyond the anticipated B Plant deactivation. B Plant has processed large quantities (> 100 megacuries) of cesium-137 and strontium-90. Residual radioactive contamination from this processing is in many forms and locations in B Plant. The plant design incorporates many features for radiological containment and confinement and systems to prevent the exposure of plant personnel and the public to excessive radiation. To minimize or reduce the radiological hazard wherever possible this program includes activities in four areas: Prevent Migration of Contamination; Stabilize Major Radioactive Source Terms; characterize Radioactive Source Terms; and Reduce Radiation Dose Rates. This document will describe work that is need to meet current goals and objectives and work that has changed, been completed, or redirected. A systems engineering approach to defining this mission was initiated in FY1994 that will also be addressed in this document.

2808 (WHC-SD-WM-PTR-011) Concentrator E-F11 water test. Ethington, P.R. Westinghouse Hanford Co., Richland, WA (United States). 25 Feb 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94012392. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the Process Test Report for performing operation testing with water of the modified E-F11 concentrator in PUREX on water. The test was performed to determine the effects of the following concentrator modifications; routing concentrator off-gasses via the PUREX air tunnel to the main stack, blanking of condenser cooling water, blanking of process condensate route to a crib, restricting flow to steam tube bundles, and routing of steam condensate to TK-F12. The test was successful. Concentrator boil-off rates of 6-7 gpm were achieved while the overheads exited the PUREX plant in vapor form. With minor recommended modifications, this process is recommended for use in processing PUREX deactivation flush solutions and other miscellaneous wastes accumulated during the completion of the deactivation project.

2809 (WHC-SD-WM-RPT-096) Rotary mode system initial instrument calibration. Johns, B.R. Westinghouse

Hanford Co., Richland, WA (United States). [1994]. 167p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000462. Source: OSTI; NTIS; INIS; GPO Dep.

The attached report contains the vendor calibration procedures used for the initial instrument calibration of the rotary core sampling equipment. The procedures are from approved vendor information files.

2810 (WHC-SD-WM-RPT-118) Vault 102 cemented waste solidification testing system. Final report. Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009156. Source: OSTI; NTIS; INIS; GPO Dep.

This final report presents a summary of all work completed in support of the ultrasonic nondestructive testing of grouted radioactive waste, along with the status of all uncompleted tasks. Tasks were left uncompleted because of the cancellation of the Hanford Grout Disposal Program. Much of the work summarized in this report has been reported on in previous submittals, but is summarized here to provide a more complete understanding of the final status of the overall project.

2811 (WHC-SD-WM-SDD-041) Software design description and configuration management plan for Acromag calibration system. Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005474. Source: OSTI; NTIS; GPO Dep.

The Acromag Calibration System consists of a thermocouple calibration unit, a DOS-based computer and a hand-held surface temperature detector. The purpose of this document is to describe how the system software is designed, how the software is controlled and how to make changes to the software.

2812 (WHC-SD-WM-SDP-011) FY95 software project management plan: TMACS, CASS computer systems. Spurling, D.G. Westinghouse Hanford Co., Richland, WA (United States). 11 Nov 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004486. Source: OSTI; NTIS; INIS; GPO Dep.

The FY95 Work Plan for TMACS and CASS Software Projects describes the activities planned for the current fiscal year. This plan replaces WHC-SD-WM-SDP-008. The TMACS project schedule is included in the TWRS Integrated Schedule.

2813 (WHC-SD-WM-SP-008) Development of the high-level waste high-temperature melter feed preparation flowsheet for vitrification process testing. Seymour, R.G. Westinghouse Hanford Co., Richland, WA (United States). 17 Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008025. Source: OSTI; NTIS; INIS; GPO Dep.

High-level waste (HLW) feed preparation flowsheet development was initiated in fiscal year (FY) 1994 to evaluate alternative flowsheets for preparing melter feed for high-temperature melter (HTM) vitrification testing. Three flowsheets were proposed that might lead to increased processing capacity relative to the Hanford Waste Vitrification Plant (HWVP) and that were flexible enough to use with

other HLW melter technologies. This document describes the decision path that led to the selection of flowsheets to be tested in the FY 1994 small-scale HTM tests. Feed preparation flowsheet development for the HLW HTM was based on the feed preparation flowsheet that was developed for the HWVP. This approach allowed the HLW program to build upon the extensive feed preparation flowsheet database developed under the HWVP Project. Primary adjustments to the HWVP flowsheet were to the acid adjustment and glass component additions. Developmental background regarding the individual features of the HLW feed preparation flowsheets is provided. Applicability of the HWVP flowsheet features to the new HLW vitrification mission is discussed. The proposed flowsheets were tested at the laboratory-scale at Pacific Northwest Laboratory. Based on the results of this testing and previously established criteria, a reductant-based flowsheet using glycolic acid and a nitric acid-based flowsheet were selected for the FY 1994 small-scale HTM testing.

2814 (WHC-SD-WM-SP-010) LIMS strategy review. Ibsen, T.G. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010042. Source: OSTI; NTIS; INIS; GPO Dep.

The evaluation team found that the LABCORE program has a viable Laboratory Information Management System (LIMS) that will handle the sample tracking and reporting necessary to accomplish the requirements established by the system specifications. The team also found that the LABCORE program has made real accomplishments and that it has been moving in the right direction, for example the phased implementation at the 222-S laboratory. The LABCORE program has many strengths but it also has shortcomings that need to be addressed. The strengths are that the hardware, software, staff, and the computer and training facilities are all first rate. The shortcomings are that it is missing a strategy outlining the goals which would clearly define when the project implementation has been successfully completed. It also had excessive cost during its acquisition. Specific recommendations are made. As a whole, the evaluation team believes that LABCORE is the system that was specified and will meet the needs of both laboratories, 222-S and the Waste Sampling and Characterization Facility. LABCORE has experienced all the challenges of a new computer system but with continued effort on the part of the LABCORE team and laboratory personnel the system will operate as needed.

2815 (WHC-SD-WM-SWD-015) Liquid Effluent Monitoring Information System (LEMIS) System Construction. Adams, R.T. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002242. Source: OSTI; NTIS; INIS; GPO Dep.

The liquid effluent sampling program is part of the effort to minimize adverse environmental impact during the cleanup operation at the Hanford Site. Of the 33 Phase I and Phase II liquid effluents, all streams actively discharged to the soil column will be sampled. The Liquid Effluent Monitoring Information System (LEMIS) is being developed as the organized information repository facility in support of the liquid effluent monitoring requirements of the Tri-Party Agreement. It is necessary to provide an automated repository into which the results from liquid effluent sampling will be placed.

This repository must provide for effective retention, review, and retrieval of selected sample data by authorized persons and organizations. This System Construction document is the aggregation of the DMR P+ methodology project management deliverables. Together they represent a description of the project and its plan through four Releases, corresponding to the definition and prioritization of requirements defined by the user.

2816 (WHC-SD-WM-SWD-033) Solid Waste Information and Tracking System (SWITS) data change request log. McKay, R.B. Westinghouse Hanford Co., Richland, WA (United States). 18 Aug 1994. 145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018465. Source: OSTI; NTIS; GPO Dep.

The Data Change Request (DCR) log is designed to promote data integrity within the Solid Waste Information and Tracking System (SWITS). It achieves this function by providing a record of all data changes performed on the database. This document contains records of those data changes from March 91 through June 94. The DCR log is also a supplement to an electronic database – the DCR Tracking System, which provides an electronic record of all data changes performed on the SWITS database. The records found in this document are Data Change Request forms. These forms are required for SWITS users who wish to request data changes in the database. The procedure formalizing this policy did not go into effect until September 1, 1994; therefore, some records created before that date may be incomplete.

2817 (WHC-SD-WM-TA-161) Analytical services contract reform alternatives project. Hunt, J.W.; Fox, M.R.; Kristofzski, J.G.; Minette, M.J. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010063. Source: OSTI; NTIS; GPO Dep.

Westinghouse Hanford Company (WHC) was directed by the U.S. Department of Energy, Richland Operations Office (DOE-RL) to examine the feasibility of outsourcing all or part of its laboratory and analytical functions as part of a contract reform effort. The analytical services provided by WHC were found to be significantly greater than that of a typical environmental laboratory which provides sample analysis based on a simple sample in-report out model. In addition to high-volume production analysis, the work scope includes special analytical services, technical consulting, sample handling and disposition, and special material preparations. Numerous broad ranging potential contract reform alternatives were identified and categorized into seven main alternatives with associated sub-alternatives. Issues associated with each alternative varied significantly depending on the alternative. Fifteen issues were identified and described including human resources, contract, and procurement areas. Readers of this report will perhaps identify additional alternatives and/or issues. In addressing the issues, it was determined that those issues pertaining to labor relations and procurement require major policy resolutions by WHC/DOE senior management prior to being able to establish meaningful assumptions for cost/benefit analyses of the seven alternatives. Further review was therefore stopped without economic analyses or recommendation for any specific alternative. Accordingly, this report is intended to fulfill the requirements of RL Milestone AS-95-016.

2818 (WHC-SD-WM-TC-054) Verification/acceptance test plan/procedure for Acromag calibration system. Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005682. Source: OSTI; NTIS; GPO Dep.

The purpose of this document is to describe and document the test of the Acromag calibration system software. The purpose of this test is to verify that the Acromag Calibration System (ACS) will reliably test the Acromag thermocouple (TC) type input modules and provide a file showing the temperatures at which the modules are tested, the response from the Acromag station, instrument data, technician data, and date and time of the test. The ACS consists of a thermocouple calibration unit (TCU), a DOS based computer, a hand held resistance temperature detector (RTD) surface probe and connects to a field installed or a bench Acromag unit.

2819 (WHC-SD-WM-TI-607) Radiological implications of contact maintenance: Impacts on facility design. Brown, R.C. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 10 Mar 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018151. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide an initial, rough order of magnitude, evaluation of the relationship between the concentrations of selected radionuclides in process streams of a chemical process plant and the required degree of protective features for plant operations personnel. The evaluation provided in this document specifies "trigger level" concentrations of ^{90}Sr , ^{137}Cs , and transuranics (TRU) for "contact maintenance" activities. Concentrations above the "trigger levels" can be accommodated provided offsetting design features are incorporated (e.g., improved shielding partial to total confinement, etc.). This information will assist in defining the degree of reduction of concentrations of radionuclides required for the feed used in a low-level liquid waste processing plant to utilize a contact maintenance design concept. Offsetting design features that influence maintenance personnel exposures in a contact maintenance situation are identified. All concentrations are expressed in terms of actual process fluids before any flushing and decontamination steps.

2820 (WHC-SD-WM-TI-608-Rev.1) Hanford analytical sample projections FY 1995–FY 2000. Revision 1. Simmons, F.M. Westinghouse Hanford Co., Richland, WA (United States). 2 Dec 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004490. Source: OSTI; NTIS; INIS; GPO Dep.

Sample projections have been categorized into 7 major areas: Environmental Restoration, Tank Waste Remediation, Solid Waste, Liquid Effluents, Site Monitoring, Industrial Hygiene, and General Process Support Programs. The estimates are through the Fiscal Year 2000 and are categorized by radiation level. The yearly sample projection for each program will be categorized as follows: Category 1: Non-Radioactive; Category 2: $<1 \text{ mR/hr } \beta/\gamma$; $<10 \text{ nCi/g } \alpha$; Category 3: $1 \text{ mR/hr } \beta/\gamma$ to $<10 \text{ mR/hr } \beta/\gamma$; and $<10 \text{ nCi/g } \alpha$; Category 4: $<10 \text{ mR/hr } \beta/\gamma$; and $<200 \text{ nCi/g } \alpha$; Category 5: $10 \text{ mR/hr } \beta/\gamma$ to $<100 \text{ mR/hr } \beta/\gamma$; and $<200 \text{ nCi/g } \alpha$; Category 6: $>100 \text{ mR/hr } \beta/\gamma$; and Category 7: $>200 \text{ nCi/g } \alpha$.

2821 (WHC-SD-WM-TI-654) Documentation for initial testing and inspections of Beneficial Uses Shipping System (BUSS) Cask. Lundeen, J.E. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 262p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001237. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to compile data generated during the initial tests and inspections of the Beneficial Uses Shipping System (BUSS) Cask. In addition, this report will verify that the testing criteria identified in section 8.1 of the BUSS Cask Safety Analysis Report for Packaging (SARP) was met. The BUSS Cask Model R-1 is a type B shipping container used for shipment of radioactive cesium-137 and strontium-90 capsules to Waste Encapsulation and Storage Facility (WESF). The BUSS Cask body and lid are each one-piece forgings fabricated from ASTM A473, Type 304 stainless steel. The primary purpose of the BUSS Cask is to provide shielding and confinement as well as impact, puncture, and thermal protection for the capsules under both normal and accident conditions. Chapter 8 of the BUSS Cask SARP requires several acceptance tests and inspections, each intended to evaluate the performance of different components of the BUSS Cask system, to be performed before its first use. The results of the tests and inspections required are included in this document.

2822 (WHC-SD-WM-TI-659) Documentation for first annual testing and inspections of Beneficial Uses Shipping System (BUSS) Cask. Lundeen, J.E. Westinghouse Hanford Co., Richland, WA (United States). 23 Aug 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001030. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to compile data generated during the first annual tests and inspections of the Beneficial Uses Shipping System (BUSS) Cask. In addition, this report will verify that the testing criteria identified in chapter 8 of the BUSS Cask Safety Analysis Report for Packaging (SARP) was met. Section 8.2 "Maintenance and Periodic Inspection Program" of the BUSS Cask SARP requires that the following tests and inspections be performed on an annual basis: Hydrostatic pressure test; helium leak test; dye penetrant test on the trunnions and lifting lugs; and torque test on all bolts; impact limiter inspection and weight test. The first annual inspections and testing of the BUSS Cask were completed on May 5, 1994, and met the SARP criteria.

2823 (WHC-SD-WM-TI-672) Documentation for fiscal year 1995 annual BUSS cask SARP testing and inspections. Saueressig, P.T. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003847. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to compile the data generated during the Fiscal Year (FY) 1995 annual tests and inspections performed on the Beneficial Uses Shipping System (BUSS) cask. The BUSS Cask Model R-1 is a type B shipping container used for shipment of radioactive cesium-137 and strontium-90 capsules to Waste Encapsulation and Storage Facility (WESF). The primary purpose of the BUSS Cask is to provide shielding and confinement as well as impact, puncture, and thermal protection for the capsules under both normal and accident conditions. Section 8.2 "Maintenance and Periodic Inspection Program" of the

BUSS Cask SARP requires that the following tests and inspections be performed on an annual basis: hydrostatic pressure test; helium leak test; dye penetrant test on the trunnions and life lugs; torque test on all permanent bolts; and impact limiter inspection and weight test. In addition to compiling the generated data, this report will verify that the testing criteria identified in section 8.2 of the BUSS Cask Safety Analysis Report for Packaging (SARP) was met.

2824 (WHC-SD-WM-TI-680) 291-B-1 stack monitoring and sampling system annual system assessment report. Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005051. Source: OSTI; NTIS; INIS; GPO Dep.

The B Plant 291-B-1 main stack exhausts gaseous effluents to the atmosphere from the 221-B Building canyon and cells, the No. 1 Vessel Ventilation System (VVS1), the 212-B Cask Station cell ventilation system, and, to a limited capacity, the 224-B Building. VVS1 collects offgases from various process tanks in 221-B Building, while the 224-B system maintains a negative pressure in out-of-service, sealed process tanks. B Plant Administration Manual, WHC-CM-7-5, Section 5.30 requires an annual system assessment to evaluate and report the present condition of the sampling and monitoring system associated with Stack 291-B-1 (System Number B977A) at B Plant. The system is functional and performing satisfactorily.

2825 (WHC-SD-WM-TI-685) 296-B-5 Stack monitoring and sampling system annual system assessment report. Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008413. Source: OSTI; NTIS; INIS; GPO Dep.

The B Plant Administration Manual requires an annual system assessment to evaluate and report the present condition of the sampling and monitoring system associated with Stack 296-B-5 at B Plant. The sampling and monitoring system associated with stack 296-B-5 is functional and performing satisfactorily. This document is an annual assessment report of the systems associated with the 296-B-5 stack.

2826 (WHC-SD-WM-TP-330) Compatibility Grab Sampling and Analysis Plan. Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 10 Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010807. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for the purpose of compatibility.

2827 (WHC-SD-WM-TRP-197) Foam insulated transfer line test report. Squier, D.M. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 220p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003854. Source: OSTI; NTIS; INIS; GPO Dep.

Miles of underground insulated piping will be installed at the Hanford site to transfer liquid waste. Significant cost savings may be realized by using pre-fabricated polyurethane foam insulated piping. Measurements were made on

sections of insulated pipe to determine the insulation's resistance to axial expansion of the pipe, the force required to compress the foam in the leg of an expansion loop and the time required for heat up and cool down of a buried piping loop. These measurements demonstrated that the peak axial force increases with the amount of adhesion between the encasement pipe and the insulation. The compressive strength of the foam is too great to accommodate the thermal growth of long straight pipe sections into the expansion loops. Mathematical models of the piping system's thermal behavior can be refined by data from the heated piping loop.

2828 (WHC-SD-WM-TRP-212) Hydrogen recombiner catalyst test supporting data. Britton, M.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 314p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006761. Source: OSTI; NTIS; INIS; GPO Dep.

This is a data package supporting the Hydrogen Recombiner Catalyst Performance and Carbon Monoxide Sorption Capacity Test Report, WHC-SD-WM-TRP-211, Rev 0. This report contains 10 appendices which consist of the following: Mass spectrometer analysis reports: HRC samples 93-001 through 93-157; Gas spectrometry analysis reports: HRC samples 93-141 through 93-658; Mass spectrometer procedure PNL-MA-299 ALO-284; Alternate analytical method for ammonia and water vapor; Sample log sheets; Job Safety analysis; Certificate of mixture analysis for feed gases; Flow controller calibration check; Westinghouse Standards Laboratory report on Bois flow calibrator; and Sorption capacity test data, tables, and graphs.

2829 (WHC-SD-WM-TRP-227) Final report of fugitive and diffuse emissions evaluations at the Hanford Site, CY 1994. Gleckler, B.P.; Schmidt, J.W. Westinghouse Hanford Co., Richland, WA (United States). 17 Feb 1995. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008036. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study was to evaluate several of Hanford's major diffuse emission sources and evaluate the effectiveness of monitoring these sources individually versus collectively. The results from this evaluation may also be utilized to demonstrate Westinghouse's compliance status with the applicable air emissions regulations and determine if additional studies and/or evaluations are necessary. Air sampling results from four waste handling and storage facilities were collected for a one week period and analyzed. The following is a list of the selected sampling sites: Plutonium Finishing Plant; 241-BY Tank Farm; 1301-N Trench; 300 Area Trenches and North Ponds. These sites were chosen as being representative of most of the Hanford waste sites, which are known to be diffuse emission sites. The sites were evaluated on the following criteria: physical size, surface contamination levels, geology, vegetation density, surface cover, potential for occupational exposure, and potential for public exposure. The selected sites vary greatly with the selection criteria parameters, and as a result should provide representative data for most of Hanford's waste sites.

2830 (WHC-SD-WM-TRP-236) Verification/acceptance test report for the Acromag Calibration System for TMACS. Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). 25 Apr 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011803. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the Verification/Acceptance Test Report for the Acromag Calibration System (ACS) for the Tank Monitor and Control System. ACS will be implemented to check the calibration of the thermocouple input modules. Purpose of this document is to show that the ACS satisfies the system requirements in WHC-SD-WM-CSRS-009 (WHC 1993b).

2831 (WHC-SD-WM-TS-005) Test specifications for the waste information and control system. Flynn, D.F. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001029. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the test specifications for the testing of the WICS system. The Westinghouse Hanford Company (WHC) Hazardous Material Control Group (HMC) of the 222-S Laboratory has requested the development of a system, to help resolve many of the difficulties associated with tracking and data collection of containers and drums of waste. This system has been identified as Waste Information and Control System (WICS). The request for developing and implementing WICS has been made to the Automation and Simulation Engineering Group (ASE).

2832 (WHC-SD-WM-UM-027) Users manual for the Acromag calibration system. Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005473. Source: OSTI; NTIS; GPO Dep.

This document describes how to use the Acromag calibration system software. It includes the requirements and procedures for operating the ACS.

2833 (WHC-SD-WM-WP-286) Work plan for testing silicone impression material and fixture on pool cell capsule. Lundeen, J.E. Westinghouse Hanford Co., Richland, WA (United States). 9 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003058. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this work plan is to provide a safe procedure to test a cesium capsule impression fixture at Waste Encapsulation and Storage Facility (WESF). The impression will be taken with silicone dental impression material pressed down upon the capsule using the impression fixture. This test will evaluate the performance of the fixture and impression material under high radiation and temperature conditions on a capsule in a WESF pool cell.

2834 (WHC-SD-WM-WP-293) T Plant removal of PWR Chiller Subsystem. Dana, C.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005072. Source: OSTI; NTIS; INIS; GPO Dep.

The PWR Pool Chiller System is not longer required for support of the Shippingport Blanket Fuel Assemblies Storage. The Engineering Work Plan will provide the overall coordination of the documentation and physical changes to deactivate the unneeded subsystem. The physical removal of all energy sources for the Chiller equipment will be covered under a one time work plan. The documentation changes will be covered using approved Engineering Change Notices and Procedure Change Authorizations as needed.

2835 (WHC-SP-1011D-Draft) PUREX/EO₃ deactivation project management plan. Washenfelder, D.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1993. 233p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94011455. Source: OSTI; NTIS; INIS; GPO Dep.

From 1955 through 1990, the Plutonium-Uranium Extraction Plant (PUREX) provided the United States Department of Energy Hanford Site with nuclear fuel reprocessing capability. It operated in sequence with the Uranium Trioxide (EO₃) Plant, which converted the PUREX liquid uranium nitrate product to solid EO₃ powder. Final EO₃ Plant operation ended in 1993. In December 1992, planning was initiated for the deactivation of PUREX and EO₃ Plant. The objective of deactivation planning was to identify the activities needed to establish a passively safe, environmentally secure configuration at both plants, and ensure that the configuration could be retained during the post-deactivation period. The PUREX/EO₃ Deactivation Project management plan represents completion of the planning efforts. It presents the deactivation approach to be used for the two plants, and the supporting technical, cost, and schedule baselines. Deactivation activities concentrate on removal, reduction, and stabilization of the radioactive and chemical materials remaining at the plants, and the shutdown of the utilities and effluents. When deactivation is completed, the two plants will be left unoccupied and locked, pending eventual decontamination and decommissioning. Deactivation is expected to cost \$233.8 million, require 5 years to complete, and yield \$36 million in annual surveillance and maintenance cost savings.

2836 (WHC-SP-1104) Spent nuclear fuels project: FY 1995 multi-year program plan, WBS #1.4. Denning, J.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 312p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001402. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Spent Nuclear Fuel (SNF) program is to safely, reliably, and efficiently manage, condition, transport, and store Department of Energy (DOE)-owned SNF, so that it meets acceptance criteria for disposal in a permanent repository. The Hanford Site Spent Nuclear Fuel strategic plan for accomplishing the project mission is: Establish near-term safe storage in the 105-K Basins; Complete national Environmental Policy Act (NEPA) process to obtain a decision on how and where spent nuclear fuel will be managed on the site; Define and establish alternative interim storage on site or transport off site to support implementation of the NEPA decision; and Define and establish a waste package qualified for final disposition. This report contains descriptions of the following: Work Breakdown Structure; WBS Dictionary; Responsibility Assignment Matrix; Program Logic Diagrams; Program Master Baseline Schedule; Program Performance Baseline Schedule; Milestone List; Milestone Description Sheets; Cost Baseline Summary by Year; Basis of Estimate; Waste Type Data; Planned Staffing; and Fiscal Year Work Plan.

2837 (WHC-SP-1110) Analytical services FY 1995 multi-year program plan fiscal year work plan, WBS 1.5.1. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 487p.. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003047. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Analytical Services Program supports the Hanford mission by providing high quality analytical chemistry and process development services meeting client requirements. This report describes the various technical functions and requirements necessary to carry out these support objectives. Program baselines are described in Section 2 which includes a listing of resource allocation by activity. Section 3 contains the fiscal year work plan which lists the operating expenses.

2838 (WHC-SP-1114) Solid waste programs Fiscal Year 1995 multi-year program plan/fiscal year work plan WBS 1.2.1. McCarthy, M.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 1090p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003264. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Mission Plan, Volume 1, Site Guidance identifies the need for the Solid Waste Program to treat, store, and dispose of a wide variety of solid material types consisting of multiple radioactive and hazardous waste classes. This includes future Hanford Site activities which will generate new wastes that must be handled as cleanup activities are completed. Solid wastes are typically categorized as transuranic waste, low level waste, low level mixed waste, and hazardous waste. To meet this need the Solid Waste Program has defined its mission as the following - receive, store, treat, decontaminate, and dispose of solid radioactive and nonradioactive dangerous wastes in a safe, cost effective and environmentally compliant manner. This workbook contains the program overview, program baselines and fiscal year work plan for the Solid Waste Program.

2839 (WHC-SP-1115) Engineering, Analysis and Technology FY 1995 Site Support Program Plan. Suyama, R.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001298. Source: OSTI; NTIS; INIS; GPO Dep.

The vision of the Engineering, Analysis and Technology organization is to be recognized as the cost-effective supplier of specialized, integrated, multi-disciplined engineering teams to support Hanford missions. The mission of the Engineering, Analysis and Technology organization is to provide centralized engineering services. These services are focused on supplying technical design, analytical engineering and related support services that support Hanford's environmental restoration mission. These services include engineering analysis, design and development of systems and engineered equipment, supplying multi-disciplined engineering teams to all Hanford programs and project organizations, engineering document release, and site-wide leadership in the development and implementation of engineering standards, engineering practices, and configuration management processes.

2840 (WHC-SP-1119) Radiological control FY 1995 site support program plan WBS 6.7.2.4. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002107. Source: OSTI; NTIS; INIS; GPO Dep.

The 1995 Site Support Program Plan (SSPP) brings year planning and execution year planning into a single document. The plan presented consists of the following four major sections: Overview and Introduction - Health physics

has been renamed Radiological Control (RadCon) with the role of protecting workers, the public and the environment from the harmful effects of radiation resulting from the DOE Hanford Site Operations; Cost Baselines which contains cost, technical and schedule baselines; Execution Year work Plan - cost summaries and detailed descriptions of the work to be done; Appendix - including brief description of other project activities directly coupled to RadCon.

2841 (WHC-SP-1122-Vol.1) Site Support Program Plan for ICF Kaiser Hanford Company. Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 307p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002837. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. Contained in this Volume I is introductory information covering the following: Management support; president's office; communications office; legal department; strategic initiatives; organizational development; administration division including management, project planning, finances, human resources, cost estimating; management assessment; labor relations.

2842 (WHC-SP-1122-Vol.2) Site Support Program Plan for ICF Kaiser Hanford Company. Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 239p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002838. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. Contained in this Volume II is information covering the following: Operations and maintenance Utilities; Piped Utilities; Water systems Administration and Sampling; electrical utilities.

2843 (WHC-SP-1122-Vol.3) Site Support Program Plan for ICF Kaiser Hanford Company. Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002839. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. This Volume III discusses Operations and Maintenance Transportation and the Transportation Department including fleet maintenance, railroad operations and track maintenance, bus operations, solid waste disposal, special delivery services, and road maintenance.

2844 (WHC-SP-1122-Vol.4) Site Support Program Plan for ICF Kaiser Hanford Company. Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 181p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC06-87RL10930. Order Number DE95002840. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. Contained in this Vol IV is information covering the following: Energy management; general administration of support buildings; electrical safety upgrades; steam electrical recovery project.

2845 (WHC-SP-1126-Vol.4) Transition projects FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 1.3.1 and 7.1: Volume 4. Cartmell, D.B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 478p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001824. Source: OSTI; NTIS; INIS; GPO Dep.

This reference contains information about the deactivation of the Purex Process Plant located on the Hanford Reservation. This document consists of a tabular schedule of events covering the next three years.

2846 (WHC-SP-1142) Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste. Lipinski, R.M. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002968. Source: OSTI; NTIS; INIS; GPO Dep.

All transuranic (TRU) waste generators are required by US Department of Energy Order 5820.2A to package their TRU waste to comply with the Waste Acceptance Criteria (WAC) for the Waste Isolation Pilot Plant (WIPP). The Westinghouse Hanford Company (WHC) Transuranic Waste Certification Plan was developed to ensure that TRU newly waste generated at WHC meets the WIPP-WAC and/or. The methods used at WHC to package TRU waste are described in sufficient detail to meet WIPP certification or the regulations. This document is organized to provide a brief overview of waste generation operations at WHC, along with details on data management for TRU waste. The methods used to implement this plan are discussed briefly along with the responsibilities and authorities of applicable organizations. This certification plan describes how WHC complies with all applicable regulations and requirements set forth in the latest approved revision of WIPP-DOE-069.

2847 (WINCO-1160) Friction welding method of hot isostatic press can closure for the ICPP calcine immobilization program. Berry, S.M. (Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States)); Reed, T.R.; Swainston, R.C. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Sep 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013370. Source: OSTI; NTIS; GPO Dep.

An investigation of various closure techniques was performed in an effort to meet requirements for closure of evacuated waste cans to be used at Westinghouse Idaho Nuclear Company's Idaho Chemical Processing Plant. Although other sealing techniques are available, welding was considered to be the best for sealing the cans. For various reasons, techniques other than welding are not suitable for

cans that are subject to the Hot Isostatic Press (HIP) process. For example, elastomeric seals, solders, and brazing would not withstand the temperature associated (approximately 1000 degrees centigrade) with the HIP process. Mechanical joining techniques such as threading, crimping, and swaging could result in the joint opening as the can wall is deformed during HIP process. Unlike the above joint methods, welding results in physical joining of the lid or plug to the can itself, thus the wall would have to be ruptured before leakage would occur. This document investigates welding techniques for application to the can closure.

2848 (WINCO-1162) Calcined waste inventory for Calcined Solids Storage Facility IV. Penwell, D.L. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Oct 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013805. Source: OSTI; NTIS; INIS; GPO Dep.

During the period from August 28, 1982 to July 15, 1983, the New Waste Calcining Facility (NWCF) converted aqueous nuclear fuel reprocessing waste into calcine solids. The solids are stored in the fourth Calcined Solids Storage Facility (CSSF), where they are isolated from the environment. An inventory of the calcined waste in Solids Storage IV was prepared using information from the NWCF startup data, NWCF feed data, Tank Farm sample data, calcine sample data, and Solid Storage IV thermocouple data. Solids Storage IV contains dolomite and cold alumina, alumina-zirconia blend, of zirconia, and zirconia-sodium blend. As of January 1, 1984 the calcine in Solid Storage IV contained 9.051×10^6 curies of radioactivity based upon the volume and activity of the liquid calcined. The calculated versus actual calcine volumes were compared. It was determined that the calculated volume is reasonably accurate (within 5%) except when the sample results for the waste appeared unreliable. The calculated calcine temperature was compared to the actual temperature and was within 2% of the actual temperature when the waste sample results gave an accurate calcine volume.

2849 (WINCO-1199) Comparison of dry and wet methods to store spent nuclear fuel. Lopez, J.C. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Apr 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013809. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes available published information concerning the advantages and disadvantages of wet and dry storage systems for spent nuclear fuel. Findings from several source documents are presented and tabulated. These references date back to 1982 when dry storage technology for interim storage of LWR spent nuclear fuel began to be aggressively pursued. The report finds that for various types of Department of Energy fuels dry storage methods offer safe, cost effective and stable means of interim storage. The report recommends dry storage of DOE SNF on the basis of cost, safety and material stability over prolonged periods of storage.

2850 (WINCO-1206) TRUEX partitioning studies applied to ICPP sodium-bearing waste. Herbst, R.S.; Brewer, K.N.; Law, J.D.; Tranter, T.J.; Todd, T.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). May 1994. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94015532. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho Chemical Processing Plant (ICPP), located in southeast Idaho at the USDOE Idaho National Engineering Laboratory, formerly reprocessed highly enriched spent nuclear fuel to recover fissionable uranium. The HLW raffinates from the combined PUREX/REDOX type uranium recovery process were converted to solid oxides (calcine) in a high temperature fluidized bed. Liquid effluents from the calcination process were combined with liquid sodium bearing waste (SBW) generated primarily in conjunction with decontamination activities. Due to the high sodium content in the SBW, this secondary waste stream is not directly amenable to solidification via calcination. Currently, approximately 1.5 million gallons of liquid SBW are stored at the ICPP in large tanks. Several treatment options for the SBW are currently being considered, including the TRAnsUranic EXtraction (TRUEX) process developed by Horwitz and co-workers at Argonne National Laboratory (ANL), in preparation for the final disposition of SBW. Herein described are experimental results of radionuclide tracer studies with simulated SBW using the TRUEX process solvent.

2851 (WINCO-1209) Graphite fuels combustion off-gas treatment options. Kirkham, R.J.; Lords, R.E. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Mar 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. (WIN-306-Rev.1). Order Number DE94013672. Source: OSTI; NTIS; INIS; GPO Dep.

Scenarios for burning bulk graphite and for burning crushed fuel particles from graphite spent nuclear fuels have been considered. Particulates can be removed with sintered metal filters. Subsequent cooling would then condense semi-volatile fission products into or onto a particulate. These particulates would be trapped by a second sintered metal filter or downstream packed bed. A packed bed scrub column can be used to eliminate most of the iodine-129 and tritium. A molecular sieve bed is proposed to collect the residual ^{129}I and other tramp radionuclides downstream (Ruthenium, etc.). Krypton-85 can be recovered, if need be, either by cryogenics or by the KALC process (Krypton Adsorption in Liquid Carbon dioxide). Likewise carbon-14 in the form of carbon dioxide could be collected with a caustic or lime scrub solution and incorporated into a grout. Sulfur dioxide present will be well below regulatory concern level of 4.0 tons per year and most of it would be removed by the scrubber. Carbon monoxide emissions will depend on the choice of burner and start-up conditions. Should the system exceed the regulatory concern level, a catalytic converter in the final packed bed will be provided. Radon and its daughters have sufficiently short half-lives (less than two minutes). If necessary, an additional holdup bed can be added before the final HEPA filters or additional volume can be added to the molecular sieve bed to limit radon emissions. The calculated total effective dose equivalent at the Idaho National Engineering Laboratory boundary from a single release of all the ^3H , ^{14}C , ^{85}Kr , and ^{129}I in the total fuel mass is 0.43 mrem/year.

2852 (WINCO-1210) High-level waste issues and resolutions document. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). May 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94013673. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste (HLW) Issues and Resolutions Document recognizes US Department of Energy (DOE) complex-wide HLW issues and offers potential corrective actions for resolving these issues. Westinghouse Management

and Operations (M&O) Contractors are effectively managing HLW for the Department of Energy at four sites: Idaho National Engineering Laboratory (INEL), Savannah River Site (SRS), West Valley Demonstration Project (WVDP), and Hanford Reservation. Each site is at varying stages of processing HLW into a more manageable form. This HLW Issues and Resolutions Document identifies five primary issues that must be resolved in order to reach the long-term objective of HLW repository disposal. As the current M&O contractor at DOE's most difficult waste problem sites, Westinghouse recognizes that they have the responsibility to help solve some of the complexes' HLW problems in a cost effective manner by encouraging the M&Os to work together by sharing expertise, eliminating duplicate efforts, and sharing best practices. Pending an action plan, Westinghouse M&Os will take the initiative on those corrective actions identified as the responsibility of an M&O. This document captures issues important to the management of HLW. The proposed resolutions contained within this document set the framework for the M&Os and DOE work cooperatively to develop an action plan to solve some of the major complex-wide problems. Dialogue will continue between the M&Os, DOE, and other regulatory agencies to work jointly toward the goal of storing, treating, and immobilizing HLW for disposal in an environmentally sound, safe, and cost effective manner.

2853 (WINCO-1213) Conceptual design for remote handling methods using the HIP process in the Calcine Immobilization Program. Berry, S.M.; Cox, C.G.; Hoover, M.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Mar 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94014039. Source: OSTI; NTIS; INIS; GPO Dep.

This report recommends the remote conceptual design philosophy for calcine immobilization using the hot isostatic press (HIP) process. Areas of remote handling operations discussed in this report include: (1) introducing the process can into the front end of the HIP process, (2) filling and compacting the calcine/frit mixture into the process can, (3) evacuating and sealing the process can, (4) non-destructive testing of the seal on the process can, (5) decontamination of the process can, (6) HIP furnace loading and unloading the process can for the HIPing operation, (7) loading an overpack canister with processed HIP cans, (8) sealing the canister, with associated non-destructive examination (NDE) and decontamination, and (9) handling canisters for interim storage at the Idaho Chemical Processing Plant (ICPP) located on the Idaho National Engineering Laboratory (INEL) site.

2854 (WINCO-1216) ICPP radioactive liquid and calcine waste technologies evaluation: Interim report. Murphy, J.A.; Pincock, L.F.; Christiansen, I.N. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jun 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94014046. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has received spent nuclear fuel (SNF) at the Idaho Chemical Processing Plant (ICPP) for interim storage since 1951 and reprocessing since 1953. Until recently, the major activity of the ICPP has been the reprocessing of SNF to recover fissile uranium; however, changing world events have raised questions concerning the need to recover and recycle this material. In April 1992, DOE chose to discontinue reprocessing SNF for

uranium recovery and shifted its focus toward the management and disposition of radioactive wastes accumulated through reprocessing activities. Currently, 1.8 million gallons of radioactive liquid wastes (1.5 million gallons of radioactive sodium-bearing liquid wastes and 0.3 million gallons of high-level liquid waste) and 3,800 cubic meters (m³) of calcine waste are in inventory at the ICPP. Legal drivers and agreements exist obligating the INEL to develop, demonstrate, and implement technologies for safe and environmentally sound treatment and interim storage of radioactive liquid and calcine waste. Candidate treatment processes and waste forms are being evaluated using the Technology Evaluation and Analysis Methodology (TEAM) Model. This process allows decision makers to (1) identify optimum radioactive waste treatment and disposal form alternatives; (2) assess tradeoffs between various optimization criteria; (3) identify uncertainties in performance parameters; and (4) focus development efforts on options that best satisfy stakeholder concerns. The Systems Analysis technology evaluation presented in this document supports the DOE in selecting the most effective radioactive liquid and calcine waste management plan to implement in compliance with established regulations, court orders, and agreements.

2855 (WINCO-1217) INEL integrated spent nuclear fuel consolidation task team report. Henry, R.N. (and others); Clark, J.H.; Chipman, N.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). 12 Sep 1994. 240p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE95000587. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a draft plan and schedule to consolidate spent nuclear fuel (SNF) and special nuclear material (SNM) from aging storage facilities throughout the Idaho National Engineering Laboratory (INEL) to the Idaho Chemical Processing Plant (ICPP) in a safe, cost-effective, and expedient manner. A fully integrated and resource-loaded schedule was developed to achieve consolidation as soon as possible. All of the INEL SNF and SNM management task, projects, and related activities from fiscal year 1994 to the end of the consolidation period are logic-tied and integrated with each other. The schedule and plan are presented to initiate discussion of their implementation, which is expected to generate alternate concepts that can be evaluated using the methodology described in this report. Three perturbations to consolidating SNF as soon as possible are also explored. If the schedule is executed as proposed, the new and on-going consolidation activities will require about 6 years to complete and about \$25.3M of additional funding. Reduced annual operating costs are expected to recover the additional investment in about 6.4 years. The total consolidation program as proposed will cost about \$66.8M and require about 6 years to recover via reduced operating costs from retired SNF/SNM storage facilities. Detailed schedules and cost estimates for the Test Reactor Area Materials Test Reactor canal transfers are included as an example of the level of detail that is typical of the entire schedule (see Appendix D). The remaining work packages for each of the INEL SNF consolidation transfers are summarized in this document. Detailed cost and resource information is available upon request for any of the SNF consolidation transfers.

2856 (WINCO-1218) White Paper: Multi-purpose canister (MPC) for DOE-owned spent nuclear fuel (SNF). Knecht, D.A. Westinghouse Idaho Nuclear Co., Inc., Idaho

Falls, ID (United States). Apr 1994. 34p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94016421. Source: OSTI; NTIS; INIS; GPO Dep.

The paper examines the issue, What are the advantages, disadvantages, and other considerations for using the MPC concept as part of the strategy for interim storage and disposal of DOE-owned SNF? The paper is based in part on the results of an evaluation made for the DOE National Spent Fuel Program by the Waste Form Barrier/Canister Team, which is composed of knowledgeable DOE and DOE-contractor personnel. The paper reviews the MPC and DOE SNF status, provides criteria and other considerations applicable to the issue, and presents an evaluation, conclusions, and recommendations. The primary conclusion is that while most of DOE SNF is not currently sufficiently characterized to be sealed into an MPC, the advantages of standardized packages in handling, reduced radiation exposure, and improved human factors should be considered in DOE SNF program planning. While the design of MPCs for DOE SNF are likely premature at this time, the use of canisters should be considered which are consistent with interim storage options and the MPC design envelope.

2857 (WINCO-1222) SNAP and AI Fuel Summary Report. Lords, R.E. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Aug 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94018511. Source: OSTI; NTIS; INIS; GPO Dep.

The SNAP and AI Fuel Summary Report provides a detailed overview of treatment and storage of these fuels from fabrication through current storage including design parameters and reactor history. Chemical and physical characteristics are described, and potential indicators of as-stored fuel conditions are emphasized.

2858 (WINCO-1223) Disposal options for burner ash from spent graphite fuel: Final study report November 1993. Pinto, A.P. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Aug 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94019089. Source: OSTI; NTIS; INIS; GPO Dep.

Three major disposal alternatives are being considered for Fort St. Vrain Reactor (FSVR) and Peach Bottom Reactor (PBR) spent fuels: direct disposal of packaged, intact spent fuel elements; (2) removal of compacts to separate fuel into high-level waste (HLW) and low-level waste (LLW); and (3) physical/chemical processing to reduce waste volumes and produce stable waste forms. For the third alternative, combustion of fuel matrix graphite and fuel particle carbon coatings is a preferred technique for head-end processing as well as for volume reduction and chemical pretreatment prior to final fixation, packaging, and disposal of radioactive residuals (fissile and fertile materials together with fission and activation products) in a final repository. This report presents the results of a scoping study of alternate means for processing and/or disposal of fissile-bearing particles and ash remaining after combustion of FSVR and PBR spent graphite fuels. Candidate spent fuel ash (SFA) waste forms in decreasing order of estimated technical feasibility include glass-ceramics (GCs), polycrystalline ceramic assemblages (PCAs), and homogeneous amorphous glass. Candidate SFA waste form production processes in increasing order of estimated effort and cost for implementation are: low-density GCs via fuel grinding and simultaneous

combustion and waste form production in a slagging cyclone combustor (SCC); glass or low-density GCs via fluidized bed SFA production followed by conventional melting of SFA and frit; PCAs via fluidized bed SFA production followed by hot isostatic pressing (HIPing) of SFA/frit mixtures; and high-density GCs via fluidized bed SFA production followed by HIPing of Calcine/Frit/SFA mixtures.

2859 (WINCO-1229) Idaho Chemical Processing Plant spent fuel and waste management technology development program plan: 1994 Update. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE95000778. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy has received spent nuclear fuel (SNF) at the Idaho Chemical Processing Plant (ICPP) for interim storage since 1951 and reprocessing since 1953. Until April 1992, the major activity of the ICPP was the reprocessing of SNF to recover fissile uranium and the management of the resulting high-level wastes (HLW). In 1992, DOE chose to discontinue reprocessing SNF for uranium recovery and shifted its focus toward the continued safe management and disposition of SNF and radioactive wastes accumulated through reprocessing activities. Currently, 1.8 million gallons of radioactive liquid wastes (1.5 million gallons of radioactive sodium-bearing liquid wastes and 0.3 million gallons of high-level liquid waste), 3,800 cubic meters of calcine waste, and 289 metric tons heavy metal of SNF are in inventory at the ICPP. Disposal of SNF and high-level waste (HLW) is planned for a repository. Preparation of SNF, HLW, and other radioactive wastes for disposal may include mechanical, physical, and/or chemical processes. This plan outlines the program strategy of the ICPP spent Fuel and Waste Management Technology Development Program (SF&WMTDP) to develop and demonstrate the technology required to ensure that SNF and radioactive waste will be properly stored and prepared for final disposal in accordance with regulatory drivers. This Plan presents a brief summary of each of the major elements of the SF&WMTDP; identifies key program assumptions and their bases; and outlines the key activities and decisions that must be completed to identify, develop, demonstrate, and implement a process(es) that will properly prepare the SNF and radioactive wastes stored at the ICPP for safe and efficient interim storage and final disposal.

2860 (WSRC-MS-94-0567) Metallography of pitted aluminum-clad, depleted uranium fuel. Nelson, D.Z.; Howell, J.P. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950304-6: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95003906. Source: OSTI; NTIS; INIS; GPO Dep.

The storage of aluminum-clad fuel and target materials in the L-Disassembly Basin at the Savannah River Site for more than 5 years has resulted in extensive pitting corrosion of these materials. In many cases the pitting corrosion of the aluminum clad has penetrated in the uranium metal core, resulting in the release of plutonium, uranium, cesium-137, and other fission product activity to the basin water. In an effort to characterize the extent of corrosion of the Mark 31A target slugs, two unirradiated slug assemblies were removed from basin storage and sent to the Savannah River

Technology Center for evaluation. This paper presents the results of the metallography and photographic documentation of this evaluation. The metallography confirmed that pitting depths varied, with the deepest pit found to be about 0.12 inches (3.05 nun). Less than 2% of the aluminum cladding was found to be breached resulting in less than 5% of the uranium surface area being affected by corrosion. The overall integrity of the target slug remained intact.

2861 (WSRC-MS-94-0590) Tests of Cs-137 removal from DWPF samples prior to analysis. Dewberry, R.A.; Coleman, C.J. Westinghouse Savannah River Co., Aiken, SC (United States). 10 Nov 1994. 19p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940813-34: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95005006. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Waste Processing Facility (DWPF) will be used to encapsulate high-level radioactive waste into borosilicate glass at the Savannah River Site. To ensure that the process streams will be blended in the right proportions to produce durable glass, process control analyses will be performed in a laboratory in the DWPF. The high radioactivity of DWPF samples will require that sample preparation, including dissolution and dilution of samples, be performed in shielded cells. However the final analyses will be made with instruments and spectrometers contained in unshielded fume hoods. The primary radiation concern is the exposure to γ -rays from the decay of Cs-137 after samples are removed from the shielded cells. Since there are several methods available for removing Cs-137 from samples, investigations were made into removing Cs-137 from DWPF samples prior to analysis in order to reduce worker exposure. Results are presented of the efficiency of various Cs-137 removal techniques and the effects of these techniques on analytical precision and accuracy.

2862 (WSRC-MS-94-0617) Transitioning aluminum clad spent fuels from wet to interim dry storage. Louthan, M.R. Jr.; Iyer, N.C.; Sindelar, R.L.; Peacock, H.B. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950570-12: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006455. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (DOE) currently owns several hundred metric tons of aluminum clad, spent nuclear fuel and target assemblies. The vast majority of these irradiated assemblies are currently stored in water basins that were designed and operated for short term fuel cooling prior to fuel reprocessing. Recent DOE decisions to severely limit the reprocessing option have significantly lengthened the time of storage, thus increasing the tendency for corrosion induced degradation of the fuel cladding and the underlying core material. The portent of continued corrosion, coupled with the age of existing wet storage facilities and the cost of continuing basin operations, including necessary upgrades to meet current facility standards, may force the DOE to transition these wet stored, aluminum clad spent fuels to interim dry storage. The facilities for interim dry storage have not been developed, partially because fuel storage requirements and specifications for acceptable fuel forms are lacking. In spite of the lack of both facilities and

specifications, current plans are to dry store fuels for approximately 40 to 60 years or until firm decisions are developed for final fuel disposition. The transition of the aluminum clad fuels from wet to interim dry storage will require a sequence of drying and canning operations which will include selected fuel preparations such as vacuum drying and conditioning of the storage atmosphere. Laboratory experiments and review of the available literature have demonstrated that successful interim dry storage may also require the use of fuel and canister cleaning or rinsing techniques that preclude, or at least minimize, the potential for the accumulation of chloride and other potentially deleterious ions in the dry storage environment. This paper summarizes an evaluation of the impact of fuel transitioning techniques on the potential for corrosion induced degradation of fuel forms during interim dry storage.

2863 (WSRC-MS-94-0618) Acceptance criteria for interim dry storage of aluminum-clad fuels. Sindelar, R.L.; Peacock, H.B. Jr.; Iyer, N.C.; Louthan, M.R. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950570-10: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006454. Source: OSTI; NTIS; INIS; GPO Dep.

Direct repository disposal of foreign and domestic research reactor fuels owned by the United States Department of Energy is an alternative to reprocessing (together with vitrification of the high level waste and storage in an engineered barrier) for ultimate disposition. Neither the storage systems nor the requirements and specifications for acceptable forms for direct repository disposal have been developed; therefore, an interim storage strategy is needed to safely store these fuels. Dry storage (within identified limits) of the fuels received from wet-basin storage would avoid excessive degradation to assure post-storage handleability, a full range of ultimate disposal options, criticality safety, and provide for maintaining confinement by the fuel/clad system. Dry storage requirements and technologies for US commercial fuels, specifically zircaloy-clad fuels under inert cover gas, are well established. Dry storage requirements and technologies for a system with a design life of 40 years for dry storage of aluminum-clad foreign and domestic research reactor fuels are being developed by various groups within programs sponsored by the DOE.

2864 (WSRC-MS-94-0619) Evaluation of degradation during interim dry storage of aluminum-clad fuels. Sindelar, R.L.; Caskey, G.R. Jr.; Peacock, H.B. Jr.; Lam, P.S. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950570-11: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006456. Source: OSTI; NTIS; INIS; GPO Dep.

An engineered system for dry storage with a target design period of 40 years is being investigated as part of a strategy to store foreign and domestic research reactor spent fuel owned by the United States Department of Energy prior to ultimate dispositions. These fuels are highly-enriched and include cladding materials of 99% pure aluminum, aluminum-magnesium, aluminum-magnesium-silicon, and aluminum-nickel-iron-silicon alloys. Fuel matrix materials include aluminum-uranium alloy, uranium oxide, uranium silicide, and uranium metal. Handling and storage of these

fuels within limits of identified acceptance criteria would avoid excessive degradation to assure post-storage handleability, a full range of ultimate disposal options, criticality safety, and provide for maintaining primary confinement by the fuel/clad system. This paper summarizes the results to date of the evaluation of degradation of aluminum alloy clad fuels under various environmental conditions as part of the technical bases for the development of environmental limits for dry storage.

2865 (WSRC-MS-95-0010) Determination of uranium distribution in the evaporation of simulated Savannah River Site waste. Barnes, M.J.; Chandler, G.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-13: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95005482. Source: OSTI; NTIS; INIS; GPO Dep.

The results of an experimental program addressing the distribution of uranium in saltcake and supernate for two Savannah River Site waste compositions are presented. Successive batch evaporations were performed on simulated H-Area Modified Purex low-heat and post-aluminum dissolution wastes spiked with depleted uranium. Waste compositions and physical data were obtained for supernate and saltcake samples. For the H-Area Modified Purex low-heat waste, the product saltcake contained 42% of the total uranium from the original evaporator feed solution. However, precipitated solids only accounted for 10% of the original uranium mass; the interstitial liquid within the saltcake matrix contained the remainder of the uranium. In the case of the simulated post-aluminum dissolution waste; the product saltcake contained 68% of the total uranium from the original evaporator feed solution. Precipitated solids accounted for 52% of the original uranium mass; again, the interstitial liquid within the saltcake matrix contained the remainder of the uranium. An understanding of the distribution of uranium between supernatant liquid, saltcake, and sludge is required to develop a material balance for waste processing operations. This information is necessary to address nuclear criticality safety concerns.

2866 (WSRC-MS-95-0057) Applications of Atomistic Simulation to Radioactive and Hazardous Waste Glass Formulation Development. Kielpinski, A.L. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-34: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060092. Source: OSTI; NTIS; INIS; GPO Dep.

Glass formulation development depends on an understanding of the effects of glass composition on its processability and product quality. Such compositional effects on properties in turn depend on the microscopic structure of the glass. Historically, compositional effects on macroscopic properties have been explored empirically, e.g., by measuring viscosity at various glass compositions. The relationship of composition to structure has been studied by microstructural experimental methods. More recently, computer simulation has proved a fruitful complement to these more traditional methods of study. By simulating atomic interaction over a period of time using the molecular dynamics method, a direct picture of the glass structure and dynamics is obtained which can verify existing concepts as well as permit "measurement" of quantities inaccessible to experiment.

Atomistic simulation can be of particular benefit in the development of waste glasses. As vitrification is being considered for an increasing variety of waste streams, process and product models are needed to formulate compositions for an extremely wide variety of elemental species and composition ranges. The demand for process and product models which can predict over such a diverse composition space requires mechanistic understanding of glass behavior; atomistic simulation is ideally suited for providing this understanding. Moreover, while simulation cannot completely eliminate the need for treatability studies, it can play a role in minimizing the experimentation on (and therefore contact handling of) such materials. This paper briefly reviews the molecular dynamics method, which is the primary atomistic simulation tool for studying glass structure. We then summarize the current state of glass simulation, emphasizing areas of importance for waste glass process/product modeling. At SRS, glass process and product models have been formulated in terms of glass structural concepts.

2867 (WSRC-RP-94-396) Nuclear criticality safety analysis summary report: The S-area defense waste processing facility. Ha, B.C. Westinghouse Savannah River Co., Aiken, SC (United States). 21 Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005484. Source: OSTI; NTIS; INIS; GPO Dep.

The S-Area Defense Waste Processing Facility (DWPF) can process all of the high level radioactive wastes currently stored at the Savannah River Site with negligible risk of nuclear criticality. The characteristics which make the DWPF critically safe are: (1) abundance of neutron absorbers in the waste feeds; (2) and low concentration of fissionable material. This report documents the criticality safety arguments for the S-Area DWPF process as required by DOE orders to characterize and to justify the low potential for criticality. It documents that the nature of the waste feeds and the nature of the DWPF process chemistry preclude criticality.

2868 (WSRC-RP-94-532) Thirty-year solid waste generation forecast for facilities at SRS. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1994. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006474. Source: OSTI; NTIS; INIS; GPO Dep.

The information supplied by this 30-year solid waste forecast has been compiled as a source document to the Waste Management Environmental Impact Statement (WMEIS). The WMEIS will help to select a sitewide strategic approach to managing present and future Savannah River Site (SRS) waste generated from ongoing operations, environmental restoration (ER) activities, transition from nuclear production to other missions, and decontamination and decommissioning (D&D) programs. The EIS will support project-level decisions on the operation of specific treatment, storage, and disposal facilities within the near term (10 years or less). In addition, the EIS will provide a baseline for analysis of future waste management activities and a basis for the evaluation of the specific waste management alternatives. This 30-year solid waste forecast will be used as the initial basis for the EIS decision-making process. The Site generates and manages many types and categories of waste. With a few exceptions, waste types are divided into two broad groups-high-level waste and solid waste. High-level waste consists primarily of liquid radioactive waste, which is addressed in a separate forecast and is not discussed further in this document. The waste types discussed in this

solid waste forecast are sanitary waste, hazardous waste, low-level mixed waste, low-level radioactive waste, and transuranic waste. As activities at SRS change from primarily production to primarily decontamination and decommissioning and environmental restoration, the volume of each waste s being managed will change significantly. This report acknowledges the changes in Site Missions when developing the 30-year solid waste forecast.

2869 (WSRC-RP-94-584) Thirty-Year Solid Waste Generation Forecast by Treatability Group. Thomas, C. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060080. Source: OSTI; NTIS; INIS; GPO Dep.

This report is Phase II of the Thirty-Year Solid Waste Generation Forecast for Facilities at SRS. Phase I of the forecast, Thirty-Year Solid Waste Generation Forecast for Facilities at SRS (Reference 4), forecasts the yearly quantities of LLW, hazardous, mixed, and TRU wastes generated over the next 30 years by operations, decontamination and decommissioning, and ER activities at SRS. The solid wastes stored or generated at SRS must be treated and disposed of in accordance with federal, state, and local laws and regulations. To evaluate, select, and justify the use of promising treatment technologies and to evaluate the potential impacts to the environment, the generic waste categories described in the Phase I report must be divided into smaller classifications with similar physical, chemical, and radiological characteristics. These classifications, defined as treatability groups, can be used in the WMEIS process to evaluate treatment options. The methodology used to categorize the SRS Solid Waste Streams into treatability groups is based on the premise that the key information necessary for identifying like treatments can be discerned from the radiological, physical, and chemical properties of the wastes and their contaminants.

2870 (WSRC-RP-94-585) Thirty-Year Solid Waste Generation Maximum and Minimum Forecast for SRS. Thomas, L.C. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060081. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the third phase (Phase III) of the Thirty-Year Solid Waste Generation Forecast for Facilities at the Savannah River Site (SRS). Phase I of the forecast, Thirty-Year Solid Waste Generation Forecast for Facilities at SRS, forecasts the yearly quantities of low-level waste (LLW), hazardous waste, mixed waste, and transuranic (TRU) wastes generated over the next 30 years by operations, decontamination and decommissioning and environmental restoration (ER) activities at the Savannah River Site. The Phase II report, Thirty-Year Solid Waste Generation Forecast by Treatability Group (U), provides a 30-year forecast by waste treatability group for operations, decontamination and decommissioning, and ER activities. In addition, a 30-year forecast by waste stream has been provided for operations in Appendix A of the Phase II report. The solid wastes stored or generated at SRS must be treated and disposed of in accordance with federal, state, and local laws and regulations. To evaluate, select, and justify the use of promising treatment technologies and to evaluate the potential impact to the environment, the generic waste categories described in the Phase I report were divided into smaller

classifications with similar physical, chemical, and radiological characteristics. These smaller classifications, defined within the Phase II report as treatability groups, can then be used in the Waste Management Environmental Impact Statement process to evaluate treatment options. The waste generation forecasts in the Phase II report includes existing waste inventories. Existing waste inventories, which include waste streams from continuing operations and stored wastes from discontinued operations, were not included in the Phase I report. Maximum and minimum forecasts serve as upper and lower boundaries for waste generation. This report provides the maximum and minimum forecast by waste treatability group for operation, decontamination and decommissioning, and ER activities.

2871 (WSRC-RP-95-0040) Initial results from the canistered waste forms produced during the first campaign of the DWPF Startup Test Program. Harbour, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216-12: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95005480. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Defense Waste Processing Facility (DWPF) Startup Test Program, approximately 90 canisters will be filled with glass containing simulated radioactive waste during five separate campaigns. The first campaign is a facility acceptance test to demonstrate the operability of the facility and to collect initial data on the glass and the canistered waste forms. During the next four campaigns (the waste qualification campaigns) data will be obtained which will be used to demonstrate that the DWPF product meets DOE's Waste Acceptance Product Specifications (WAPS). Currently 12 of the 16 canisters have been filled with glass during the first campaign (FA-13). This paper describes the tests that have been carried out on these 12 glass-filled canisters and presents the data with reference to the acceptance criteria of the WAPS. These tests include measurement of canister dimensions prior to and after glass filling, dew point, composition, and pressure of the gas within the free volume of the canister, fill height, free volume, weight, leak rates of welds and temporary seals, and weld parameters.

2872 (WSRC-TR-94-0296) Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification. Clemons, J.S. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Jun 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001465. Source: OSTI; NTIS; INIS; GPO Dep.

The 1S Manual requires that High Level Waste (HLW) implement a waste certification program prior to sending waste packages to the E-Area vaults. To support the waste certification plan, the HLW supernate inventory of uranium, plutonium, neptunium and americium have been characterized. This characterization is based on the chemical, isotopic and radiological properties of these elements in HLW supernate. This report uses process knowledge, solubility data, isotopic inventory data and sample data to determine if any isotopes of the aforementioned elements will exceed the minimum reportable quantity (MRQ) for waste packages contaminated with HLW supernate. If the MRQ can be exceeded for a particular nuclide, then a method for estimating the waste package content is provided. Waste packages contaminated from HLW supernate

do not contain sufficient U-233, U-234, U-235, U-236, U-238, Pu-239, Pu-240, Pu-241, Pu-242 or Am-241 to warrant separate reporting on the shipping manifest. Calculations show that, on average, more than 100 gallons of supernate is required to exceed the PAC (package acceptance criteria) for each of these nuclides. Thus it is highly unlikely that the PAC would be exceeded for these nuclides and unlikely that the MRQ would be exceeded. These nuclides should be manifested as zero for waste packages contaminated with HLW supernate. The only actinide isotopes that may exceed the MRQ are Np-237 and Pu-238. The recommended method to calculate the amount of these two isotopes in waste packages contaminated with HLW supernate is to ratio them to the measured Cs-137 activity.

2873 (WSRC-TR-94-0577) Wet/dry sounding reel tape. Final report. Speed, D.L. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Nov 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060102. Source: OSTI; NTIS; INIS; GPO Dep.

The Interim Waste Technology (IWT) section of the Savannah River Technology Center evaluated a demonstration model of a modified reel tape for High-Level Waste Engineering. The standard Robertshaw Model 185 reel tape is used in the Tank Farms as a conductivity probe to monitor liquid levels in waste tanks within ± 0.1 in. The demonstration model features a device that also stops the reel tape motor on loss of tension in the tape. Tests conducted at TNX showed that the modification enabled the reel tape to locate solid surfaces such as saltcake within approximately ± 0.5 in. The modified reel tape also located, within approximately ± 0.5 in., the sludge/supernate boundary exhibited by sludge from TNX Tank F, which closely approximates the sludge expected to exist after the Tank 42H sludge wash process. IWT recommends that the tape tension modification, with the associated controls, be installed in all Robertshaw reel tapes used in the Tank Farms. The modified probe should also be considered for installation in those tanks that have a free or submerged semi-solid surface of interest.

2874 Laser ablation of Al_2O_3 ceramic in gas and plasma environments. Ching, C.H. (Univ. of Michigan, Ann Arbor, MI (United States). Intense Energy Beam Interaction Lab.); Gilgenbach, R.M.; Lash, J.S.; Lindley, R.A. pp. 100 of IEEE conference record - Abstracts. IEEE Service Center, Piscataway, NJ (United States) (1994). pp. 252 (CONF-940604-: 1994 Institute of Electrical and Electronic Engineers (IEEE) international conference on plasma science, Santa Fe, NM (United States), 6-8 Jun 1994).

Krypton-fluoride laser ablation experiments have been performed on Al_2O_3 (alumina) to investigate the dynamics of species generated in reacting (air or oxygen) versus nonreacting (argon) gases and RF-plasmas. Typical laser fluences are about 4 J/cm^2 and gas-fill pressures are in the range from 10^{-2} to 10 Torr. A resonant-holographic-interferometry diagnostic has characterized Al ground-state neutral line-densities and shown that laser ablation of alumina targets emits 10 to 20 times higher line-densities of Al neutrals than Al metal targets. The absorbed fluence of ultraviolet KrF laser light by alumina is estimated to be about 12 times higher than Al metal. Molecular (AIO) populations in laser ablation plumes are being characterized by emission spectroscopy for reacting versus nonreacting gas/plasma backgrounds.

2875 Mass balance of reaction products from irradiated TCE vapor. Matthews, S.M. (Lawrence Livermore National Lab., CA (United States)); Wang, F.T.S.; Mill, T.; Su, M.; Yao, C.C.D. pp. 142 of IEEE conference record - Abstracts. IEEE Service Center, Piscataway, NJ (United States) (1994). pp. 252 (CONF-940604-: 1994 Institute of Electrical and Electronic Engineers (IEEE) international conference on plasma science, Santa Fe, NM (United States), 6-8 Jun 1994).

Trichloroethylene (TCE) vapor, at a concentration of 3,000 ppmv in synthetic air, was sealed in Tedlar bags and irradiated with a 3.7 MeV electron beam. Bags of dry vapor and vapor at 90% relative humidity were irradiated. Doses up to 11 megarads (11 MR) were applied. Each bag was chemically analyzed for reaction products and a mass balance of the chlorine and carbon was obtained within the 11 MR dose range. The results of these radiolysis experiments and chemical analysis show that, given the proper treatment, the TCE concentration is reduced to below detection limit and the reaction products of the organic carbon and chlorine are carbon monoxide (CO), carbon dioxide (CO_2), chlorine gas (Cl_2) and hydrochloric acid (HCl). No detectable amounts of dichloroacetyl chloride (DCAC) or phosgene (PG) remained in the sample after proper treatment. DCAC and PG were found only as intermediary oxidation products of the TCE. High energy ionizing radiation, as electron beams and bremsstrahlung, is a new treatment technology for destroying toxic compounds and hazardous wastes. A demonstration of complete destruction of organic products, using this treatment at standard temperature and pressure, is expected to help implement the use of this technology.

2876 Pyrochemical recovery of actinide elements from spent light water reactor fuel. Johnson, G.K. (Argonne National Lab., IL (United States). Chemical Technology Div.); Pierce, R.D.; Poa, D.S.; McPheeters, C.C. pp. 199-214 of Actinide processing: Methods and materials. Mishra, B. (ed.); Averill, W.A. (ed.). The Minerals, Metals and Materials Society, Warrendale, PA (United States) (1994). pp. 408 DOE Contract W-31109-ENG-38. (CONF-940204-: 123. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994).

Argonne National Laboratory is investigating salt transport and lithium pyrochemical processes for recovery of transuranic (TRU) elements from spent light water reactor fuel. The two processes are designed to recover the TRU elements in a form compatible with the Integral Fast Reactor (IFR) fuel cycle. The IFR is uniquely effective in consuming these long-lived TRU elements. The salt transport process uses calcium dissolved in Cu-35 wt% Mg in the presence of a CaCl_2 salt to reduce the oxide fuel. The reduced TRU elements are separated from uranium and most of the fission products by using a MgCl_2 transport salt. The lithium process, which does not employ a solvent metal, uses lithium in the presence of a LiCl salt as the reductant. After separation from the salt, the reduced metal is introduced into an electrorefiner, which separates the TRU elements from the uranium and fission products. In both processes, reductant and reduction salt are recovered by electrochemical decomposition of the oxide reaction product.

2877 Electrode materials for the reduction of CaO and Li_2O for actinide pyroprocessing. McDeavitt, S.M. (Argonne National Lab., IL (United States)); Smith, J.L.; McPheeters, C.C.; Pierce, R.D.; Poa, D.S. pp. 215 of Actinide processing: Methods and materials. Mishra, B. (ed.);

Averill, W.A. (ed.). *The Minerals, Metals and Materials Society*, Warrendale, PA (United States) (1994). pp. 408 DOE Contract W-31109-ENG-38. (CONF-940204-: 123. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994).

A pyrochemical process is being developed at Argonne National Laboratory to recover the actinide elements from spent oxide nuclear fuel. The process uses calcium or lithium metal as the reducing agent with molten salts and liquid metals as solvents. The reaction product, CaO or Li₂O, is subsequently reduced electrochemically to be re-used and to reduce waste. The reduction has been done using a graphite anode, but graphite has an inherent carbon dusting problem which may contaminate the recovery process and form actinide carbides. One solution to this problem is to surround the anode with an inert, porous shroud of MgO to contain the carbon dust while still allowing the reduced metal to collect at the cathode. Other material systems are being studied as alternatives to graphite. Consumable and non-consumable anode concepts are viable options and anodes have been fabricated and tested using metal, ceramic, and cermet materials.

2878 NDA: A new day for American assay. Schultz, F.J. (Oak Ridge National Lab., TN (United States)); Chapman, J.A. pp. 238-242 of 35th Annual meeting proceedings. Volume XXIII. Institute of Nuclear Materials Management, Northbrook, IL (United States) ([1994]). pp. 1360 DOE Contract AC05-84OR21400. (CONF-940748-: 35. annual meeting of the Institute of Nuclear Materials Management (INMM), Naples, FL (United States), 17-20 Jul 1994).

The Department of Energy's (DOE) Nondestructive Assay/Nondestructive Examination Interface Working Group (NDA/NDE IWG) began in 1982 as an ad-hoc gathering of scientists interested in various aspects of radioactive waste NDA. Originally, its purpose was to exchange operational experience gained as a result of designing and operating NDA equipment, such as passive-active neutron (PAN) and segmented gamma scanning systems (SGS). Through the years, the NDA/NDE IWG has become a more structured group and has performed many diverse tasks for the DOE - from studying the transport of neutrons in a PAN system to preparing a training outline for real-time x-ray machine operators. Recently, the IWG began a very important task: the design, preparation, and implementation of a performance test program for various NDA instruments used throughout the DOE complex. This program will become part of an overall qualification program for NDA instruments used in certifying transuranic (TRU) waste prior to being shipped to the Waste Isolation Pilot Plant in Carlsbad, New Mexico. This program is the first of its kind for the DOE NDA community and, consequently, will present many challenges to the designers, participants, and project integration team members.

2879 Processing of spent salt from the molten salt oxidation of hazardous and radioactive wastes. Navratil, J.D. (Rockwell International Corp., Canoga Park, CA (United States)). pp. 267-273 of Actinide processing: Methods and materials. Mishra, B. (ed.); Averill, W.A. (ed.). *The Minerals, Metals and Materials Society*, Warrendale, PA (United States) (1994). pp. 408 (CONF-940204-: 123. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994).

The basic concept of MSO is to introduce air and wastes into a bed of molten salt, oxidize the organic wastes in the molten salt, and when required, remove the salt for disposal

or processing. MSO has been developed through pilot-scale, with successful destruction demonstration of hazardous and mixed wastes. Organic constituents are destroyed with high efficiencies, and ash, heavy metals and radioactive species are retained in the salt. MSO typically effects significant volume reductions; however, additional reductions can be obtained through salt processing strategies. This paper reviews MSO and presents new options for spent salt processing.

2880 Interface phenomena in Synroc, a titanate-based nuclear waste ceramic. Vance, A.R. (Advanced Materials Program, Ansto, New South Wales (Australia)); Ball, C.J.; Blackford, M.G.; Day, R.A.; Lumpkin, G.R.; Smith, K.L.; Hart, K.P.; McGlinn, P.; Thorogood, G.J. pp. 431-439 of *Science of ceramic interfaces: Part 2*. Nowotny, J. (ed.). Elsevier Science Publishers, Amsterdam (Netherlands) (1994). pp. 705 (CONF-9302205-: International workshop on interfaces of ceramic materials, Lucas Heights (Australia), 1-5 Feb 1993).

Several aspects of Synroc which fall into the broad class of interface phenomena are discussed. These are radiation damage processes which give rise to interfaces between damage tracks and neighbouring unirradiated material, intergranular films which have deleterious effects on chemical durability, and aqueous leaching of Synroc which takes place primarily at the interface between the solid and groundwater. 2 figs., 3 tabs., 15 refs.

2881 Optical fiber smart structures applied to secure containers. Sliva, P. (Pacific Northwest Lab., Richland, WA (United States)); Gordon, N.R.; Stahl, K.A.; Simmon, K.L.; Anheier, N.C. pp. 670-675 of 35th Annual meeting proceedings. Volume XXIII. Institute of Nuclear Materials Management, Northbrook, IL (United States) ([1994]). pp. 1360 DOE Contract AC06-76RL01830. (CONF-940748-: 35. annual meeting of the Institute of Nuclear Materials Management (INMM), Naples, FL (United States), 17-20 Jul 1994).

A prototype secure container was prepared that uses continually monitored optical fiber as the smart structure. A small (≈7.6 cm x 10.2 cm x 12.7 cm), matchbox-shaped container consisting of an inner drawer within an outer shell was fabricated from polymer resin. The optical fiber was sandwiched between additional non-optical, strength-promoting fibers and embedded into the polymer. The additional non-optical fiber provides strength to the container, protects the optical fiber from damage, hides the fiber and acts as a decoy. The optical fiber was wound with a winding density such that a high probability of fiber damage would be expected if the container was penetrated. The inner drawer and outer shell were wound with optical fiber that optically couples when the two halves are joined to form a continuous optical pathway. Electronic circuitry located in the base of the inner drawer sends and receives an infrared signal through the fiber several times a second (20 Hz). For demonstration, when the drawer is opened, interrupting the fiber loop and creating a container "breach," an alarm beeper is activated. The beeper can be turned off using an infrared remote control. When the drawer is re-closed, the alarm circuitry automatically resets so that any subsequent breach again sets off the beeper.

2882 Overview of the efficient separations and processing integrated program (ESPIP). Fryberger, T.B. (Department of Energy, Germantown, MD (United States)); Kuhn, W.L.; Watson, J.S. pp. 718, Paper I&EC 66 of 208th

ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

The U.S. Department of Energy's (DOE) Efficient Separations and Processing Integrated Program (ESPIP) supports chemical separations research directed toward solving waste management problems at DOE sites. This overview of the ESPIP describes current research, research needs, and strategy for defining and funding future research. Research is conducted in parallel on new chemical separating agents, physical interfaces for chemical separations, processes implementing new separation agents, and integration of new processes into remediation activities at DOE sites. Research focuses primarily on aqueous phase separations that provide exceptional affinity for target species, both radioactive and nonradioactive; exceptional selectivity for target species in high-ionic strength solutions; durability of separating agents and other materials in strong bases and acids and in strong radiation fields; and certainty and simplicity of full-scale implementation. Research on dissolution of transition metal sludges in waste storage tanks and pyrochemical processes is also described.

2883 The design of metal ion specific extractants for use in polyethylene glycol-based aqueous biphasic systems. Bauer, C.B. (Northern Illinois Univ., DeKalb, IL (United States)); Rogers, R.D. pp. 735, Paper I&EC 64 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The authors are currently investigating the partitioning behavior of various metal ions in polyethylene glycol (PEG)-based aqueous biphasic systems. With the exception of technetium (as TcO_4^-), partitioning to the PEG-rich phase can only be achieved by using an extractant which will complex the metal ion of interest and then distribute the complex to the polymer phase. Traditionally, the design of extractants for use in liquid/liquid systems has involved the incorporation of lipophilic groups to facilitate solubility in the organic phase. Due to the unique, aqueous nature of the systems these extractants are not useful and therefore the use of new classes of water soluble extractants needs to be investigated. The factors that govern ligand partitioning are still not clear but based on the previous work with complexing dyes it is clear that large molecules with multiple aromatic rings functionalized with hydrophilic sulfonate groups will partition quantitatively to the PEG-rich phase. With this in mind, the authors have begun to search for new extractants which are commercially available or for non-commercially available compounds which can be functionalized to make them more water soluble. This paper focuses on the partitioning of a variety of new extractants and their affect on metal ion distribution ratios.

2884 Aggregation of polyethylene glycol in aqueous solutions. Chaiko, D.J. (Argonne National Lab., IL (United States)); Thiyagarajan, P. pp. 735, Paper I&EC 65 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 DOE Contract W-31109-ENG-38. (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Polyethylene glycols (PEGs) form immiscible biphasic systems with a variety of inorganic salts. A detailed knowledge

of the configuration of PEG in aqueous solutions is required for a better understanding of the mechanisms responsible for biphasic formation and solute partitioning. To this end, the authors have studied the solution structure of aqueous PEG/electrolyte solutions using small-angle neutron scattering (SANS) and small-angle x-ray scattering (SAXS). The molecular weights of the PEGs used in these studies ranged from 1500 to 10,000. The measurements clearly indicate that polymer self-assembly plays a significant role in the phase behavior of PEG.

2885 Large-scale commercial applications of the in situ vitrification remediation technology. Campbell, B.E. (Geosafe Corp., Richland, WA (United States)); Hansen, J.E.; McElroy, J.L.; Thompson, L.E.; Timmerman, C.L. pp. 799-808 of Superfund XV conference proceedings. Volume 1. Hazardous Materials Control Resources Institute, Rockville, MD (United States) (1994). pp. 866 (CONF-941189-: SUPERFUND XV: 15th environmental conference and exhibition for the hazardous materials/hazardous waste management industry, Washington, DC (United States), 29 Nov - 1 dec 1994).

The first large-scale commercial application of the innovative In Situ Vitrification (ISV) remediation technology was completed at the Parsons Chemical/ETM Enterprises Superfund site in Michigan State midyear 1994. This project involved treating 4,800 tons of pesticide and mercury-contaminated soil. The project also involved performance of the USEPA SITE Program demonstration test for the ISV technology. The Parsons project involved consolidation and staging of contaminated soil from widespread locations on and nearby the site. This paper presents a brief description of the ISV technology along with case-study type information on these two sites and the performance of the ISV technology on them. The paper also reviews other remediation projects where ISV has been identified as the/a preferred remedy, and where ISV is currently planned for use. These sites include soils contaminated with pesticides, dioxin, PCP, paint wastes, and a variety of heavy metals. This review of additional sites also includes a description of a planned radioactive mixed waste remediation project in Australia that contains large amounts of plutonium, uranium, lead, beryllium, and metallic and other debris buried in limestone and dolomitic soil burial pits. Initial test work has been completed on this application, and preparations are now underway for pilot testing in Australia. This project will demonstrate the applicability of the ISV technology to the challenging application of buried mixed wastes.

2886 Expedited site characterization: A rapid, cost-effective process for preremedial site characterization. Burton, J.C. (Argonne National Lab., IL (United States)); Walker, J.L.; Jennings, T.V.; Aggarwal, P.K.; Hastings, B.; Meyer, W.T.; Rose, C.M.; Rosignolo, C.L. pp. 809-826 of Superfund XIV conference and exhibition: Proceedings. Volume 2. Hazardous Materials Control Resources Inst., Rockville, MD (United States) (1994). pp. 710 DOE Contract W-31109-ENG-38. (CONF-931122-: Superfund 14: conference and exhibition, Washington, DC (United States), 30 Nov - 2 dec 1993).

Argonne National Laboratory has developed a unique, cost- and time-effective, technically innovative process for preremedial site characterization, referred to as Expedited Site Characterization (ESC). The cost of the ESC field sampling process ranges from 1/10 to 1/5 of the cost of traditional site characterization. The time required for this ESC

field activity is approximately 1/30 of that for current methods. Argonne's preremedial site investigations based on this approach have been accepted by the appropriate regulatory agencies. The ESC process is flexible and neither site nor contaminant dependent. The process has been successfully tested and applied in site investigations of multiply contaminated landfills in New Mexico and at former grain storage facilities in Nebraska and Kansas, contaminated with carbon tetrachloride. A working demonstration of this process was sponsored by the US Department of Energy (DOE) Office of Technology Development as a model of the methodology needed to accelerate site characterizations at DOE facilities. The result of this process is the optimization of the field activity to produce a high-quality technical product that is both cost and time effective. Argonne has achieved technically sound site characterizations that are acceptable to regulatory agencies and have provided extensive cost and time savings in both the BLM and CCC/USDA programs.

2887 Isomer effects on the complexation of metal ions by crown ethers. Gatrone, R.C. (Argonne National Lab., IL (United States)); Smith, L.A.; Clapper-Gowdy, M.; Dietz, M.L.; Horwitz, E.P. pp. 1141, Paper ORGN 167 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 DOE Contract W-31109-ENG-38. (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

To more fully understand the role that the various isomers of dicyclohexano-18-crown-6 have on the extraction of strontium and potassium from acidic nitrate media, especially the largely ignored trans-syn-trans, trans-anti-trans, and cis-trans isomers, the authors have begun a program to stereoselectively synthesize and isolate each of the five possible isomers of DCH18C6. The results of the synthetic effort and the complexation of strontium, potassium, and nitric acid by the three additional crown isomers previously uninvestigated are reported.

2888 Cobalt dicarbollide containing polymer resins for cesium and strontium uptake. Steckle, W.P. Jr. (Los Alamos National Lab., NM (United States)); Duke, J.R. Jr.; Jorgensen, B.S. pp. 1612, Paper PMSE 274 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Large amounts of high level radioactive waste has been generated by the atomic industry over the past several decades. These wastes exist as a mixture of radioactive elements and flocculants that makes processing difficult. A majority of the thermal energy produced in these waste arises from $^{137}\text{Cs}^+$ and $^{90}\text{Sr}^{2+}$. Cobalt(III) dicarbollide $[(\text{C}_2\text{B}_9\text{H}_{11})_2\text{Co}]^-$ has been found to selectively extract these cations from solution. Unfortunately the current technology employs extracting these metals into nitrobenzene. In order to avoid the use of organic solvents in processing these wastes it is the goal to attach these dicarbollide moieties to a base resin in a manner where they can be utilized as a quasi-ion exchange resin. Once these metals have been removed from the waste streams it is hoped that they can be washed off the resins then vitrified into glass logs. The base resins that have successfully derivitized include polystyrene and polybenzimidazole. A series of derivatives was prepared starting with carborane ($\text{C}_2\text{B}_{10}\text{H}_{12}$), lithium carbollide $[(\text{C}_2\text{B}_9\text{H}_{11})^- \text{Li}^+]$, and finally cobalt dicarbollide. The reaction proceeds by anionically grafting the carborane derivatives

onto a chloromethylated resin. The synthesis and subsequent characterization of these materials is investigated.

2889 Direct detection of tributyl phosphate adsorbed on surfaces of environmental interest by static SIMS. Groenewold, G.S. (Idaho National Engineering Laboratory, Idaho Falls, ID (United States)); Ingram, J.C.; Appelhans, A.D.; Delmore, J.E.; Dahl, D.A. pp. 634A-634B of Proceedings of the 41st ASMS conference on mass spectrometry and allied topics. ASMS, East Lansing, MI (United States) (1993). pp. 1158 (CONF-9305222-: 41. American Society of Mass Spectrometry conference on mass spectrometry and allied topics, San Francisco, CA (United States), 30 May - 4 Jun 1993).

Tributyl phosphate (TBP) was widely used in the DOE complex to recover U, Pu, Th, Np and Am. The compound is not toxic by itself, but it may be useful as an indicator for the presence of Pu, U and other contaminants at DOE burial sites. TBP can be analyzed by extraction/GC/MS, but this analysis is time consuming. Further, the compound can adsorb strongly onto mineral surfaces, thereby making extraction difficult. The Idaho National Engineering Laboratory (INEL) and Hanford have sites that are contaminated with TBP. The predominant mineral in both areas is basalt, which is a black aluminosilicate material studded with Fe and other transition metals. The basalt is very porous, and wet chemical extraction can be difficult. The objective of the present research is to develop rapid methods and instrumentation for the analysis of TBP on minerals and other refractory materials. Ideally, the technology should be fieldable, and should require minimal sample preparation, thereby avoiding the generation of laboratory waste. Clearly, the ability to directly analyze amorphous, irregular materials like basalt is desirable.

2890 Detection of metal complexing agents on mineral surfaces by static SIMS. Groenewold, G.S. (Idaho National Engineering Laboratory, Idaho Falls, ID (United States)); Ingram, J.C.; Appelhans, A.D.; Delmore, J.E.; Dahl, D.A. pp. 643A-643B of Proceedings of the 41st ASMS conference on mass spectrometry and allied topics. ASMS, East Lansing, MI (United States) (1993). pp. 1158 (CONF-9305222-: 41. American Society of Mass Spectrometry conference on mass spectrometry and allied topics, San Francisco, CA (United States), 30 May - 4 Jun 1993).

Ethylenediaminetetraacetic acid (EDTA) and related compounds [nitriloacetic acid (NTA) and diethylenetriaminepentaacetic acid (DTPA)] have been widely used at Department of Energy facilities for complexing radionuclides, and have been disposed of together with radionuclides. EDTA is not toxic by itself, but decreases the ability of minerals to adsorb radionuclides, and enhances the mobility of radionuclides in the environment. Additional motivation for studying EDTA is related to its implication in the generation of H_2 in the Hanford nuclear waste storage tanks. EDTA analysis have been effectively performed using derivatization/GC/MS, and electrospray MS. However, due to the polyfunctional nature of the molecule, screening for EDTA on surfaces, and determination of EDTA speciation can be time consuming and difficult. The objective of the INEL research effort is to develop rapid methods and instrumentation for analysis of EDTA on minerals and other refractory materials, and also having the potential for determining EDTA speciation. Ideally, minimal sample preparation would be required, and little or no lab waste would be generated.

2891 Efficient analysis using custom interactive visualization tools at a Superfund site. Williams, G. (Northwestern Univ., Evanston, IL (United States)); Durham, L. pp. 1060-1072 of HMC/Superfund '92. Hazardous Materials Control Resources Institute, Greenbelt, MD (United States) (1992). pp. 1150 (CONF-921235-: Hazardous Materials Control/Superfund '92: 13th annual conference and exhibition, Washington, DC (United States), 1-3 Dec 1992).

Custom visualization analysis programs were developed and used to analyze contaminant transport calculations from a three-dimensional numerical groundwater flow model developed for a Department of Energy Superfund site. The site hydrogeology, which is highly heterogeneous, includes both fractured limestone and dolomite and alluvium deposits. Three-dimensional interactive visualization techniques were used to understand and analyze the three-dimensional, double-porosity modeling results. A graphical, object-oriented programming environment was applied to efficiently develop custom visualization programs in a coarse-grained data structure language. Comparisons were made, using the results from the three-dimensional, finite-difference model, between traditional two-dimensional analyses (contour and vector plots) and interactive three-dimensional techniques. Subjective comparison areas include the accuracy of analysis, the ability to understand the results of three-dimensional contaminant transport simulation, and the capability to transmit the results of the analysis to the project management. In addition, a quantitative comparison was made on the time required to develop a thorough analysis of the modeling results. The conclusions from the comparative study showed that the visualization analysis provided an increased awareness of the contaminant transport mechanisms, provided new insights into contaminant migration, and resulted in a significant time savings.

2892 Mercury extraction by the TRUEX process solvent. II. Selective partitioning of mercury from co-extracted actinides in a simulated acidic ICPP waste stream. Brewer, K.N. (Westinghouse Idaho Nuclear Co., Inc., ID (United States)); Herbst, R.S.; Tranter, T.J.; Todd, T.A. *Solvent Extraction and Ion Exchange (United States)*; 13(3): 447-464 (May 1995).

The TRUEX process is being evaluated at the Idaho Chemical Processing Plant (ICPP) as a means to partition the actinides from acidic sodium-bearing waste (SBW). The mercury content of this waste averages 1 g/l. Because the chemistry of mercury has not been extensively evaluated in the TRUEX process, mercury was singled out as an element of interest. Radioactive mercury, ^{203}Hg , was spiked into a simulated solution of SBW containing 1 g/l mercury. Successive extraction batch contacts with the mercury spiked waste and successive scrubbing and stripping batch contacts of the mercury loaded TRUEX solvent (0.2 M CMPO-1.4 M TBP in dodecane) show that mercury will extract into and strip from the solvent. The extraction distribution coefficient for mercury, as HgCl_2 , from SBW having a nitric acid concentration of 1.4 M and a chloride concentration of 0.035 M was found to be 3. The stripping distribution coefficient was found to be 0.5 with 5 M HNO_3 and 0.077 with 0.25 M Na_2CO_3 . Because experiments described here show that mercury can be extracted from SBW and stripped from the solvent, a process has been developed to partition mercury from the actinides in SBW. 10 refs., 3 figs., 10 tabs.

2893 PASS, an extended-range Ge spectrometer for radionuclide analysis via L X-, γ -ray spectrometry. Gehrke, R.J. (Idaho National Engineering Laboratory, EG

and G Idaho, Inc., Idaho Falls, ID 83415-2114 (United States)); Watts, K.D.; Killian, E.W.; Putnam, M.H. *Nuclear Instruments and Methods in Physics Research, Section A*; 353(1-3): 109-113 (30 Dec 1994). (CONF-940524-: 8. symposium on radiation measurements and applications, Ann Arbor, MI (United States), 16-19 May 1994).

PASS (Photon Analysis Spectrometer System) is a pulser-equipped, extended range, thin-window, Ge detector spectrometer that is capable of automatically measuring radionuclide activity concentrations in up to 100 samples per day at remediation sites. No operator intervention is required after the counting queue for the sample changer has been setup. Actinides are measured from L X-rays following α decay such as $^{241}\text{Pu} \rightarrow ^{241}\text{Am}$ and $^{241}\text{Am} \rightarrow ^{237}\text{Np}$ and from low-energy γ -rays by spectral component analysis. Activation, fission products and a few actinides (e.g., ^{241}Am) are measured from their characteristic γ -ray emission by fitting the associated peaks. Pulses from a precision, dual-energy pulser can be used to determine the energy scale, provide documentation of the data quality, and provide a correction for pulse pileup. Soil, smear, and air particulate samples can be counted. For an 11-g sample counted for 15 min the lower-limits-of-detection are 50, 1, and 5 pCi/g for plutonium, americium, and several γ -ray emitting radionuclides, respectively. ((orig.))

2894 Surface-enhanced Raman optical data storage: A new optical memory with three-dimensional data storage. Vo-Dinh, T. (Advanced Monitoring Development Group, Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831 (United States)); Stokes, D.L. *Review of Scientific Instruments (United States)*; 65(12): 3766-3770 (Dec 1994). DOE Contract AC05-84OR21400.

A new optical data storage technology based on the surface-enhanced Raman scattering (SERS) effect has been developed for high-density optical memory and three-dimensional data storage. With the surface-enhanced Raman optical data storage (SERODS) technology, the molecular interactions between the optical layer molecules and the substrate are modified by the writing laser, changing their SERS properties, so that they are encoded to store information as bits. Since the SERS properties are extremely sensitive to molecular microenvironments, very small "spectrochemical holes" approaching the diffraction limit can be produced for the writing process. The SERODS device uses a reading laser to induce the SERS emission of molecules on the disk and a photometric detector tuned to the frequency of the Raman spectrum to retrieve the stored information. The results illustrate that SERODS is capable of three-dimensional data storage.

2895 Crown ethers as actinide extractants in acidic aqueous biphasic systems: partitioning behavior in solution and crystallographic analyses of the solid state. Rogers, R.D. (Department of Chemistry, Northern Illinois University, DeKalb, IL 60115 (United States)); Bauer, C.B.; Bond, A.H. *Journal of Alloys and Compounds*; 213-214: 305-312 (Oct 1994). (CONF-930905-: Actinides '93, Santa Fe, NM (United States), 19-24 Sep 1993).

The partitioning behavior of UO_2^{2+} , Pu^{4+} , Th^{4+} , and Am^{3+} has been investigated in aqueous biphasic systems formed by the addition of polyethylene glycol of average molecular weight 2000 (PEG-2000) and $(\text{NH}_4)_2\text{SO}_4$. Water-soluble crown ethers 18-crown-6 and 15-crown-5 have been utilized as extractants. A positive correlation has been observed between crown ether concentration and metal ion partitioning

with D_{An} decreasing in the order $UO_2^{2+} > Pu^{4+} > Th^{4+} > Am^{3+}$. A distribution ratio above unity, however, has only been observed for UO_2^{2+} at very high (1.25 M) concentrations of 18-crown-6. In general the distribution ratios for 15-crown-5 are all lower. Matrix ions introduced as NH_4NO_3 , H_2SO_4 , or HNO_3 drastically reduce the observed distribution ratios and level the extractant dependencies. ((orig.))

2896 Volatilization of cesium-137 from soil with chloride amendments during heating and vitrification. Spalding, B.P. (Oak Ridge National Lab., TN (United States)). *Environmental Science and Technology*; 28(6): 1116-1123 (Jun 1994). DOE Contract AC05-84OR21400.

During vitrification of soil and soil:limestone mixtures, significant volatilization (> 10%) of the radioisotope ^{137}Cs occurred particularly in the presence of small amounts (<5%) of chloride-containing species including sodium chloride, calcium chloride, hydrochloric acid, and poly(vinyl chloride). Sodium chloride was found to be the most effective, resulting in volatilization of >99% of the ^{137}Cs by repeated amendment and treatment at 1000°C. Amendment with sodium borate and subsequent heating to 1200°C also stimulated significant volatilization of ^{137}Cs . However, amendments up to 10% of other chemicals including carbonates, nitrates, phosphates, sulfates, fluorides, polystyrene, graphite, stainless steels, iron, zinc oxide, and antimony oxide did not increase ^{137}Cs volatilization compared to unamended samples. The majority of the chloride-induced volatilization occurred between 800 and 1000°C for sodium chloride-amended samples of both soil and soil:limestone mixtures. Thus, an effective and potentially efficient soil decontamination technique for ^{137}Cs has been identified. 17 refs., 8 figs., 3 tabs.

2897 Ultrasonic destruction of chlorinated compounds in aqueous solution. Wu, J.M. (Argonne National Lab., IL (United States)); Huang, H.S.; Livengood, C.D. *Environmental Progress (United States)*; 11(3): 195-201 (Aug 1992). DOE Contract W-31109-ENG-38.

The application of ultrasonic-wave energy for the destruction of low concentrations of carbon tetrachloride into nonhazardous end products is described, and the results of experimental work are presented. Process parameters studied included steady-state temperature, concentration, pH, irradiation time, and the intensity of the applied ultrasonic-wave energy. Greater than 99% destruction efficiencies were achieved through this process, and the irradiation time required for a given degree of destruction decreased with increasing intensity of the ultrasonic energy. In addition, a detailed chemical reaction mechanism for the destruction of carbon tetrachloride in water was formulated. The agreement between the model and experimental results is generally good. 22 refs., 12 figs., 1 tab.

2898 Application of diode lasers to actinide atom monitoring. Lipert, R.J. (Department of Energy, Ames, IA (United States)); Lee, S.C.; Edelson, M.C. *Applied Spectroscopy (United States)*; 46(8): 1307-1308 (Aug 1992). DOE Contract W-7405-ENG-82.

The authors are interested in developing real-time analytical methods based on optical spectroscopy to monitor actinides as they exist in the nuclear fuel cycle. These methods can form a part of nuclear safeguards system methods can form a part of nuclear safeguards system designed to prevent the diversion of fissile nuclear materials, such as ^{239}Pu and ^{235}U , from peaceful to hostile uses. To achieve wide use, these methods must be sensitive, have isotopic

selectivity, be rapid, and be easily implemented in industrial settings. Uranium has a rich spectrum with transitions from low-lying levels occurring in the red and near-infrared regions of the spectrum. These wavelengths can be reached with GaAlAs diode lasers. Unlike Pb-salt diode lasers that emit in the infrared and require cryogenic cooling, GaAlAs diode lasers operate near room temperature. The authors have used a 4-mW GaAlAs diode laser, tunable from 773 nm to 797 nm, to detect neutral uranium atoms by exciting the 620-13,463 cm^{-1} transition at 778.413 nm. The uranium atoms were generated by sputtering in a commercial hollow cathode lamp constructed of depleted uranium. The absorption of the diode laser light by the uranium atoms was detected by optogalvanic spectroscopy. 8 refs., 1 fig.

2899 The hydration of borosilicate waste glass in liquid water and steam at 200°C. Ebert, W.L. (Argonne National Lab., IL (United States). Chemical Technology Div.); Bates, J.K.; Bourcier, W.L. *Waste Management (United States)*; 11: 205-221 (1991).

Simulated borosilicate waste glass was hydrated in steam at 200 C for times up to 40 days to assess the effect of a very high glass surface area/leachant volume (SA/V) ratio on the reaction. The reactions in steam attained an SA/V in excess of 4,000 m^{-1} due to the limited amount of water that was available to condense on the glass surface. Experiments in liquid water were performed at an SA/V of 40 m^{-1} for comparison. A solid reaction layer formed on the glass surface in both environments, and the thickness of this layer was used as a measure of the reaction progress. Other secondary phases formed on top of (and within) the layer on the steam-reacted samples after a few days of reaction but not on samples reacted in liquid water. The rate (layer thickness/time) measured in experiments with liquid water slows with time while the reaction in steam is very slow initially but then proceeds at a high rate after secondary phases form. The secondary phases are believed to increase the reaction rate by lowering the solution concentrations of glass species (probably most importantly silicon) which control the reaction affinity. The glass reaction is accelerated in a steam environment relative to liquid environment because, in steam, the small solution volume becomes saturated and precipitates are formed after much less glass has reacted. The experimental technique described allows secondary phases to be generated within short time periods at elevated temperatures in a steam environment. Knowledge of the phases formed is necessary to predict the long-term reaction rate. Precipitates formed on the steam-reacted samples were identified using SEM/EDS analysis and XRD. The EQ3/6 computer code was used to predict secondary phases formed at 200 C for comparison to the observed phases. Differences in the assemblage predicted by the computer simulation and that produced in the experiments are attributed to the limited data base used by the simulation.

2900 Internal pipe attachment mechanism. Bast, R.M.; Chesnut, D.A.; Henning, C.D.; Lennon, J.P.; Pastrnak, J.W.; Smith, J.A. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,372,391/A. 13 Dec 1994. Filed date 22 Feb 1993. U.S. Patent Application 8-020,925. Int. Cl. F16L 37/08. [10p.] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An attachment mechanism is described for repairing or extending fluid carrying pipes, casings, conduits, etc. utilizing one-way motion of spring tempered fingers to provide a mechanical connection between the attachment mechanism

and the pipe. The spring tempered fingers flex to permit insertion into a pipe to a desired insertion depth. The mechanical connection is accomplished by reversing the insertion motion and the mechanical leverage in the fingers forces them outwardly against the inner wall of the pipe. A seal is generated by crushing a sealing assembly by the action of setting the mechanical connection. 6 figures.

2901 Apparatus for in situ heating and vitrification. Buelt, J.L.; Oma, K.H.; Eschbach, E.A. To Battelle Memorial Inst., Richland, WA (United States). U.S. Patent 5,316,411/A. 31 May 1994. Filed date 21 Dec 1992. U.S. Patent Application 7-994,172. Int. Cl. E02D 3/00; E02D 3/11. [10p.] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An apparatus for decontaminating ground areas where toxic chemicals are buried includes a plurality of spaced electrodes located in the ground and to which a voltage is applied for bringing about current flow. Power delivered to the ground volatilizes the chemicals that are then collected and directed to a gas treatment system. A preferred form of the invention employs high voltage arc discharge between the electrodes for heating a ground region to relatively high temperatures at relatively low power levels. Electrodes according to the present invention are provided with preferentially active lower portions between which current flows for the purpose of soil heating or for soil melting and vitrification. Promoting current flow below ground level avoids predominantly superficial treatment and increases electrode life. 15 figs.

2902 Self-referencing remote optical probe. O'Rourke, P.E.; Prather, W.S.; Livingston, R.R. U.S. Patent 5,039,224/A. 13 Aug 1991. Filed date 12 Feb 1990. U.S. Patent Application 7-478,327. Int. Cl. G01N 21/05; G01N 21/85. [10p.] DOE Contract AC09-76SR00001. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A probe is described for remote spectrometric measurements of fluid samples having a hollow probe body with a sliding reflective plug therein and a lens at one end, ports for admitting and expelling the fluid sample and a means for moving the reflector so that reference measurement can be made with the reflector in a first position near the lens and a sample measurement can be made with the reflector away from the lens and the fluid sample between the reflector and the lens. Comparison of the two measurements will yield the composition of the fluid sample. The probe is preferably used for remote measurements and light is carried to and from the probe via fiber optic cables. 3 figures.

2903 Optrode for sensing hydrocarbons. Miller, H.; Milanovich, F.P.; Hirschfeld, T.B.; Miller, F.S. To Univ. of California, Berkeley, CA (United States). U.S. Patent 4,771,006/A. 13 Sep 1988. Filed date 13 Feb 1987. Int. Cl. G01N 21/64. [10p.] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A two-phase system employing the Fujiwara reaction is provided for the fluorometric detection of halogenated hydrocarbons. A fiber optic is utilized to illuminate a column of pyridine trapped in a capillary tube coaxially attached at one end to the illuminating end of the fiber optic. A strongly alkaline condition necessary for the reaction is maintained by providing a reservoir of alkali in contact with the column of

pyridine, the surface of contact being adjacent to the illuminating end of the fiber optic. A semipermeable membrane caps the other end of the capillary tube, the membrane being preferentially permeable to the halogenated hydrocarbon and but preferentially impermeable to water and pyridine. As the halogenated hydrocarbon diffuses through the membrane and into the column of pyridine, fluorescent reaction products are formed. Light propagated by the fiber optic from a light source, excites the fluorescent products. Light from the fluorescence emission is also collected by the same fiber optic and transmitted to a detector. The intensity of the fluorescence gives a measure of the concentration of the halogenated hydrocarbons. 5 figs.

EFFICIENT SEPARATIONS

Refer also to citation(s) 921, 928, 1417, 1678, 1870, 2329, 2532

2904 (ANL-93/38) Separations Science and Technology, Semiannual progress report, October 1991-March 1992. Vandegrift, G.F. (and others); Betts, S.; Chamberlain, D.B. Argonne National Lab., IL (United States). Jan 1994. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94016415. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports on the work done by the Separations Science and Technology Programs of the Chemical Technology Division, Argonne National Laboratory, in the period October 1991-March 1992. This effort is mainly concerned with developing the TRUEX process for removing and concentrating actinides from acidic waste streams contaminated with transuranic (TRU) elements. The objectives of TRUEX processing are to recover valuable TRU elements and to lower disposal costs for the nonTRU waste product of the process. Two other projects are underway with the objective of developing (1) a membrane-assisted solvent extraction method for treating natural and process waters contaminated by volatile organic compounds and (2) evaporation technology for concentrating radioactive waste and product streams such as those generated by the TRUEX process.

2905 (ANL-94/29) Separation science and technology. Semiannual progress report, April 1992-September 1992. Vandegrift, G.F. (and others); Betts, S.; Bowers, D.L. Argonne National Lab., IL (United States). Sep 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005614. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports on the work done by the Separations Science and Technology Programs of the Chemical Technology Division, Argonne National Laboratory, in the period April-September 1992. This effort is mainly concerned with developing the TRUEX process for removing and concentrating actinides from acidic waste streams contaminated with transuranic (TRU) elements. The objectives of TRUEX processing are to recover valuable TRU elements and to lower disposal costs for the nonTRU waste product of the process. Two other projects are underway with the objective of developing (1) a membrane-assisted solvent extraction method for treating natural and process waters contaminated by volatile organic compounds and (2) evaporation technology for concentrating radioactive waste and product streams such as those generated by the TRUEX process.

2906 (ANL-94/33) Basic TRUEX process for Rocky Flats Plant. Leonard, R.A.; Chamberlain, D.B.; Dow, J.A.; Farley, S.E.; Nunez, L.; Regalbuto, M.C.; Vandegrift, G.F. Argonne National Lab., IL (United States). Aug 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005880. Source: OSTI; NTIS; INIS; GPO Dep.

The Generic TRUEX Model was used to develop a TRUEX process flowsheet for recovering the transuranics (Pu, Am) from a nitrate waste stream at Rocky Flats Plant. The process was designed so that it is relatively insensitive to changes in process feed concentrations and flow rates. Related issues are considered, including solvent losses, feed analysis requirements, safety, and interaction with an evaporator system for nitric acid recycle.

2907 (ANL-94/43) Methods for removing transuranic elements from waste solutions. Slater, S.A.; Chamberlain, D.B.; Connor, C.; Sedlet, J.; Srinivasan, B.; Vandegrift, G.F. Argonne National Lab., IL (United States). Nov 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007955. Source: OSTI; NTIS; INIS; GPO Dep.

This report outlines a treatment scheme for separating and concentrating the transuranic (TRU) elements present in aqueous waste solutions stored at Argonne National Laboratory (ANL). The treatment method selected is carrier precipitation. Potential carriers will be evaluated in future laboratory work, beginning with ferric hydroxide and magnetite. The process will result in a supernatant with alpha activity low enough that it can be treated in the existing evaporator/concentrator at ANL. The separated TRU waste will be packaged for shipment to the Waste Isolation Pilot Plant.

2908 (ANL-94/47) Development program for magnetically assisted chemical separation: Evaluation of cesium removal from Hanford tank supernatant. Nunez, L. (Argonne National Lab., IL (United States)); Buchholz, B.A.; Ziemer, M.; Dyrkacz, G.; Kaminski, M.; Vandegrift, G.F.; Atkins, K.J.; Bos, F.M.; Elder, G.R.; Swift, C.A. Argonne National Lab., IL (United States). Dec 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007819. Source: OSTI; NTIS; INIS; GPO Dep.

Magnetic particles (MAG*SEPSM) coated with various absorbents were evaluated for the separation and recovery of low concentrations of cesium from nuclear waste solutions. The MAG*SEPSM particles were coated with (1) clinoptilolite, (2) transylvanian volcanic tuff, (3) resorcinol formaldehyde, and (4) crystalline silico-titanate, and then were contacted with a Hanford supernatant simulant. Particles coated with the crystalline silico-titanate were identified by Bradtec as having the highest capacity for cesium removal under the conditions tested (variation of pH, ionic strength, cesium concentration, and absorbent/solution ratio). The MAG*SEPSM particles coated with resorcinol formaldehyde had high distribution ratios values and could also be used to remove cesium from Hanford supernatant simulant. Gamma irradiation studies were performed on the MAG*SEPSM particles with a gamma dose equivalent to 100 cycles of use. This irradiation decreased the loading capacity and distribution ratios for the particles by greater than 75%. The particles demonstrated high sensitivity to radiolytic damage due to the degradation of the polymeric regions. These results were supported by optical microscopy measurements. Overall, use of magnetic particles for cesium separation under nuclear waste conditions was found to be marginally effective.

2909 (ANL/CMT/CP-81057) Plutonium and americium separation using organophosphorus extractant absorbed onto ferromagnetic particles. Nunez, L.; Vandegrift, G.F. Argonne National Lab., IL (United States). 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301-27: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94010463. Source: OSTI; NTIS; GPO Dep.

A process for the separation of radioactive constituents from radioactive wastes utilizing CMPO and TBP, in addition to magnetic separation, is described.

2910 (ANL/CMT/CP-82152) Actinide separation of high-level waste using solvent extractants on magnetic microparticles. Nunez, L.; Buchholz, B.A.; Kaminski, M.; Aase, S.B.; Brown, N.R.; Vandegrift, G.F. Argonne National Lab., IL (United States). Chemical Technology Div. [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940813-30: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95002987. Source: OSTI; NTIS; INIS; GPO Dep.

Polymeric-coated ferromagnetic particles with an absorbed layer of octyl(phenyl)-N,N-diisobutylcarbamoylmethylphosphine oxide (CMPO) diluted by tributyl phosphate (TBP) are being evaluated for application in the separation and the recovery of low concentrations of americium and plutonium from nuclear waste solutions. Due to their chemical nature, these extractants selectively complex americium and plutonium contaminants onto the particles, which can be recovered from the waste solution using a magnet. The effectiveness of the extractant-absorbed particles at removing transuranics (TRU) from simulated solutions and various nitric acid solutions was measured by gamma and liquid scintillation counting of plutonium and americium. The HNO₃ concentration range was 0.01 M to 6M. The partition coefficients (K_d) for various actinides at 2M HNO₃ were determined to be between 3,000 and 30,000. These values are larger than those projected for TRU recovery by traditional liquid/liquid extraction. Results from transmission electron microscopy indicated a large dependence of K_d on relative magnetite location within the polymer and the polymer surface area. Energy disperse spectroscopy demonstrated homogeneous metal complexation on the polymer surface with no metal clustering. The radiolytic stability of the particles was determined by using ⁶⁰Co gamma irradiation under various conditions. The results showed that K_d more strongly depends on the nitric acid dissolution rate of the magnetite than the gamma irradiation dose. Results of actinide separation from simulated high-level waste representative of that at various DOE sites are also discussed.

2911 (ANL/CMT/CP-82400) Effect of alpha-radiolysis on TRUEX-NPH solvent. Buchholz, B.A.; Nunez, L.; Vandegrift, G.F. Argonne National Lab., IL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940813-27: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95001065. Source: OSTI; NTIS; GPO Dep.

An unexpectedly high degradation of the TRUEX (TRansUranic EXtraction) solvent occurred during the treatment of waste solutions from the New Brunswick Laboratory. The waste solutions treated contained approximately

1 g/L of Pu-239 and 20 mg/L of Am-241. Earlier studies of α -radiolysis using carbon tetrachloride (CCl_4) rather than normal paraffinic hydrocarbons (NPH) as a diluent indicated greater resistance to radiation damage than observed. For this study, the TRUEX-NPH solvent was loaded with Am-241 in nitric acid, irradiated with doses up to 3.5 Mrad, and monitored for decline in extraction capability as a function of absorbed dose. Results of this study are being used to improve the Generic TRUEX Model (GTM), a thermodynamic model that permits flowsheet design for solvent extraction processing.

2912 (CONF-940225-124) Strontium removal from caustic carbonate waste solutions using carrier coprecipitation. Bostick, D.A.; Arnold, W.D. Jr.; Burgess, M.W. Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94018132. Source: OSTI; NTIS; INIS; GPO Dep.

A carrier coprecipitation procedure has been developed for the radioactive strontium from caustic liquid low-level waste (LLLW) generated at Oak Ridge National Laboratory. The from caustic liquid low-level waste (LLLW) generated at Oak two-step treatment process involves the addition of normal Sr (as SrCl_2) to the waste matrix, which is composed primarily of 0.3 M NaOH and 0.6 M Na_2CO_3 . The active Sr equilibrates with the normal Sr carrier and coprecipitates as SrCO_3 at pH 13. A liquid/solid separation is made before the pH of the supernate is reduced to pH 8 with sulfuric acid. During the neutralization step, the aluminum in the waste precipitates as $\text{Al}(\text{OH})_3$. Further Sr decontamination is achieved as traces of active Sr sorb to the $\text{Al}(\text{OH})_3$ that precipitates during the neutralization step. A final liquid/solid separation is made at pH 8 to remove the sorbed active Sr.

2913 (CONF-940815-37) Treatment of radioactive wastes from DOE underground storage tanks. Collins, J.L.; Egan, B.Z.; Spencer, B.B.; Chase, C.W.; Anderson, K.K.; Bell, J.T. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94013827. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-scale batch tests have been conducted with sludge and supernate tank waste from the Melton Valley Storage Tank (MVST) Facility at Oak Ridge National Laboratory (ORNL) to evaluate separation technology process for use in a comprehensive sludge processing flow sheet as a means of concentrating the radionuclides and reducing the volumes of storage tank waste at national sites for final disposal. This paper discusses the separation of the sludge solids and supernate, the basic washing of the sludge solids, the acidic dissolution of the sludge solids, and the removal of the radionuclides from the supernate.

2914 (CONF-940815-38) The US Department of Energy's Student Video Program. Beeson, K.M. (Stoller (S.M.) Corp., Oak Ridge, TN (United States)); Pepper, C.E. Oak Ridge National Lab., TN (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International

nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE94013828. Source: OSTI; NTIS; GPO Dep.

The Student Video Program was an educational outreach program intended to educate and involve high school students in environmental restoration and waste management issues. Through participation in this program the students were shown how science and math are related to these subjects. In addition, they were exposed to many different and interesting career opportunities.

2915 (LA-SUB-95-28) An investigation of the applicability of the new Reillex™-HPQ anion exchange resin system for technetium/rhenium and uranium in the Hanford waste tanks. Milestone 4 final report. Ashley, K.R.; Ball, J.R.; Cobb, S.L.; Adams, J.M.; Young, D.A. Los Alamos National Lab., NM (United States); East Texas State Univ., Commerce, TX (United States). Dept. of Chemistry. 30 Sep 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007643. Source: OSTI; NTIS; INIS; GPO Dep.

Results of the measurements of the exchange capacity and K_d values for ReO_4^- on Reillex™-HPQ as a function of nitric acid and hydroxide concentration, temperature, and ten months time will be reported. Results of the breakthrough volumes for UO_2^{2+} on Reillex-HPQ chromatography columns as a function of carbonate ion concentration in high nitrate ion concentrations and various column sizes will be reported. Individual sections of this report describe the following: the sorption behavior of ReO_4^- on the Reillex-HPQ between pH 2 and 12 in 1.00 M NaNO_3 ; results of the measurements of the K_d values for ReO_4^- on Reillex-HPQ and on Reillex-HP as a function of nitrate and hydroxide ion concentrations; the sorption behavior of ReO_4^- on Reillex-HPQ resin in base with time as a variable; the results of the early attempts at determining the K_d values for $\text{Na}_4\text{UO}_2(\text{CO}_3)_3$ on Reillex-HPQ resin; and the breakthrough of $\text{UO}_2(\text{NO}_3)_2$ in varying nitric acid solutions on Reillex-HPQ columns.

2916 (ORNL/TM-12785) Citrate based "TALSPEAK" lanthanide-actinide separation process. Del Cul, G.D.; Bond, W.D.; Toth, L.M.; Davis, G.D.; Dai, S.; Metcalf, D.H. Oak Ridge National Lab., TN (United States). Sep 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002059. Source: OSTI; NTIS; INIS; GPO Dep.

The potential hazard posed to future generations by long-lived radionuclides such as the transuranic elements (TRU) is perceived as a major problem associated with the use of nuclear power. TRU wastes have to remain isolated from the environment for "geological" periods of time. The costs of building, maintaining, and operating a "geological TRU repository" can be very high. Therefore, there are significant economical advantages in segregating the relatively low volume of TRU wastes from other nuclear wastes. The chemical behavior of lanthanides and actinides, 4f and 5f elements respectively, is rather similar. As a consequence, the separation of these two groups is difficult. The "TALSPEAK" process (Trivalent Actinide Lanthanide Separations by Phosphorus-reagent Extraction from Aqueous Complexes) is one of the few means available to separate the trivalent actinides from the lanthanides. The method is based on the preferential complexation of the trivalent actinides by an aminopolycarboxylic acid. Cold experiments showed that by using citric acid the deleterious effects produced by impurities such as zirconium are greatly reduced.

2926 (PNL-SA-23598) Washing and caustic leaching of Hanford tank sludges. Lumetta, G.J.; Rapko, B.M.; Colton, N.G. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940813-31: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95003146. Source: OSTI; NTIS; INIS; GPO Dep.

Methods are being developed to treat and dispose of large volumes of radioactive wastes stored in underground tanks at the U.S. Department of Energy's (DOE) Hanford Site. In the baseline process for pretreating Hanford tank sludges, the sludge is leached under caustic conditions, then the solubilized components of the sludge are removed by water washing. The purpose of the caustic leaching is to remove certain sludge components (e.g., Al, Cr, and P) that impact the volume of high-level waste borosilicate glass produced in treating these wastes. Tests of this method have been performed with samples taken from five different tanks at Hanford. The tests show that leaching with several molar NaOH solutions at 100°C results in marked improvement in the removal of Al, Cr, and P from the sludge when compared to washing with dilute NaOH solutions.

2927 (PNL-SA-24320) Using 15-crown-5, 18-crown-6 and dicyclohexano-18-crown-6 for Am, Ce, Eu and Cm extraction from acid solutions. Romanovski, V.V. (St. Petersburg Technological Institute (Russian Federation)); Proyaev, V.V.; Wester, D.W. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-96: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94018918. Source: OSTI; NTIS; INIS; GPO Dep.

The extraction from nitric acid of Am, Eu, Ce, Cm(III) tracers by 15-crown-5 (15C5), 18-crown-6 (18C6), dicyclohexano-18-crown-6 (DCH18C6) as well as mixtures of crown ethers and chlorinated cobalt dicarbollide (ChCoD) in nitrobenzene solutions has been investigated. It was revealed that 18C6 is selective for Ce, Am and Cm compared with Eu. The addition of 18C6 to a solution of ChCoD allows Am and Cm to be separated from lanthanides by using this extractant more efficiently. The separation factors of Ce, Am, Cm and Eu are increased as a function of the ionic strength of the aqueous phase for extraction by mixtures of 18C6 and ChCoD and of DCH18C6 and ChCoD.

2928 (PNL-SA-24451) Membrane mediated separation of tritiated water from water without phase change. Nelson, D.A.; Duncan, J.B.; Jensen, G.A.; Burton, S.D. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941102-43: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95007810. Source: OSTI; NTIS; INIS; GPO Dep.

This development effort at the Pacific Northwest Laboratory (PNL) has been directed toward the separation of tritium (via ^3HOH or HTO) from contaminated ground water with the use of membrane technology. Tritium contamination exists in both aquifers and water used for reactor cooling and represents both a technical and financial challenge for the Department of Energy. Currently, the primary option for the remediation low-level tritium is migration with time

through geological formations. However, point sources containing tritiated water can be attacked by separation technology, thus directly addressing environmental concerns. The separation technology reported here is especially applicable to tritium contaminated water generated in nuclear fuel storage basins. At Hanford, the dual K-Basins contain 1000 metric tons of fuel with cooling waters; the K-East Basin contains 5.7 million liters of water at 11.1 MBq (3 $\mu\text{Ci/L}$). The K-West Basin contains 300,000 pCi/L also due to canister leakage. At the Savannah River Site, the L-Reactor Basin (15.2 million liters of water) and K-Reactor Disassembly Basins have held fuel rods for 5 years and many have corroded. Tritium levels are near that of the Hanford basins. At INEL, Building 603 stores more than 13,200 Kg of fuel rods in three pools of lesser volume than the Hanford or Savannah River Sites. Experience with membrane systems in industry indicates that they are inherently energy efficient. In the work at PNL, aromatic polyphosphazenes were chosen as the polymeric material for the membranes being investigated because they have been shown to possess excellent isothermal stability above 300°C and are quite robust under radiolysis conditions.

2929 (PNL-SA-25549) High-capacity, selective solid sequestrants for innovative chemical separation: Inorganic ion exchange approach. Bray, L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950171-1: Efficient Separations and Processing Cross-cutting Program technical exchange meeting, Gaithersburg, MD (United States), 24-26 Jan 1995). Order Number DE95007804. Source: OSTI; NTIS; INIS; GPO Dep.

TTP/RL321204.

The approach of this task is to develop high-capacity, selective solid inorganic ion exchangers for the recovery of cesium and strontium from nuclear alkaline and acid wastes. To achieve this goal, Pacific Northwest Laboratories (PNL) is collaborating with industry and university participants to develop high capacity, selective, solid ion exchangers for the removal of specific contaminants from nuclear waste streams.

2930 (SAND-94-2380C) Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants. Klavetter, E.A. (Sandia National Labs., Albuquerque, NM (United States)); Brown, N.E.; Trudell, D.; Zheng, Z.; Thibaud-Erkey, C.; Gu, D.; Anthony, R.G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940813-29: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95001618. Source: OSTI; NTIS; INIS; GPO Dep.

A new class of inorganic ion exchangers, called crystalline silicotitanates (CSTs), has been prepared at Sandia National Laboratories and Texas A&M University. CSTs have been determined to have high selectivity for the adsorption of Cs and Sr, and several other radionuclides from highly alkaline, high-sodium supernate solutions such as those found at Westinghouse Hanford (WHC). Continuous flow, ion-exchange columns are expected to be used to remove Cs and other radionuclides from the Hanford tank supernate. The proposed application for the CST would be Cs removal from highly alkaline salt solutions in a single pass process with interim storage of the Cs loaded CST until the glass

vitrification plant is operational. This paper presents test results which address material requirements relevant for Hanford radwaste processing. This paper also discusses the integrated experimental and modeling approach being developed to establish the performance of the CST materials for the range of solution compositions and processing conditions which are expected to occur. The status on the commercialization of the CST material is also discussed.

2931 (WHC-EP-0766) Chemistry of application of calcination/dissolution to the Hanford tank waste inventory. Deleard, C.H.; Elcan, T.D.; Hey, B.E. Westinghouse Hanford Co., Richland, WA (United States). May 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94014639. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 330,000 metric tons of sodium-rich radioactive waste originating from separation of plutonium from irradiated uranium fuel are stored in underground tanks at the Hanford Site in Washington State. Fractionation of the waste into low-level waste (LLW) and high-level waste (HLW) streams is envisioned via partial water dissolution and limited radionuclide extraction operations. Under optimum conditions, LLW would contain most of the chemical bulk while HLW would contain virtually all of the transuranic and fission product activity. Calcination at around 850 C, followed by water dissolution, has been proposed as an alternative initial treatment of Hanford Site waste to improve waste dissolution and the envisioned LLW/HLW split. Results of literature and laboratory studies are reported on the application of calcination/dissolution (C/D) to the fractionation of the Hanford Site tank waste inventory. Both simulated and genuine Hanford Site waste materials were used in the lab tests. To evaluation confirmed that C/D processing reduced the amount of several components from the waste. The C/D dissolutions of aluminum and chromium allow redistribution of these waste components from the HLW to the LLW fraction. Comparisons of simple water-washing with C/D processing of genuine Hanford Site waste are also reported based on material (radionuclide and chemical) distributions to solution and solid residue phases. The lab results show that C/D processing yielded superior dissolution of aluminum and chromium sludges compared to simple water dissolution. 57 refs., 26 figs., 18 tabs.

2932 (WHC-EP-0832) Chemistry of proposed calcination/dissolution processing of Hanford Site tank wastes. Deleard, C.H. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005982. Source: OSTI; NTIS; INIS; GPO Dep.

Plans exist to separate radioactive waste stored in underground tanks at the US Department of Energy's Hanford Site in south central Washington State into low-level and high-level fractions, and to immobilize the separate fractions in high-integrity vitrified forms for long-term disposal. Calcination with water dissolution has been proposed as a possible treatment for achieving low/high-level separation. Chemistry development activities conducted since 1992 with simulated and genuine tank waste show that calcination/dissolution destroys organic carbon and converts nitrate and nitrite to hydroxide and benign offgases. The process also dissolves significant quantities of bulk chemicals (aluminum, chromium, and phosphate), allowing their redistribution from the high-level to the low-level fraction. Present studies of the chemistry of calcination/dissolution processing of genuine

wastes, conducted in the period October 1993 to September 1994, show the importance of sodium fluoride phosphate double salt in controlling phosphate dissolution. Peptization of waste solids is of concern if extensive washing occurs. Strongly oxidizing conditions imposed by calcination reactions were found to convert transition metals to soluble anions in the order chromate > manganate > ferrate. In analogy with manganese behavior, plutonium dissolution, presumably by oxidation to more soluble anionic species, also occurs by calcination/dissolution. Methods to remove plutonium from the product low-level solution stream must be developed.

2933 (WHC-SA-2480) Calcination/dissolution testing for Hanford Site tank wastes. Colby, S.A. (Westinghouse Hanford Co., Richland, WA (United States)); Deleard, C.H.; McLaughlin, D.F.; Danielson, M.J. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940813-20: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE94018002. Source: OSTI; NTIS; INIS; GPO Dep.

Thermal treatment by calcination offers several benefits for the treatment of Hanford Site tank wastes, including the destruction of organics and ferrocyanides and an hydroxide fusion that permits the bulk of the mostly soluble nonradioactive constituents to be easily separated from the insoluble transuranic residue. Critical design parameters were tested, including: (1) calciner equipment design, (2) hydroxide fusion chemistry, and (3) equipment corrosion. A 2 gal/minute pilot plant processed a simulated Tank 101-SY waste and produced a free flowing 700 C molten calcine with an average calciner retention time of 20 minutes and >95% organic, nitrate, and nitrite destruction. Laboratory experiments using actual radioactive tank waste and the simulated waste pilot experiments indicate that 98 wt% of the calcine produced is soluble in water, leaving an insoluble transuranic fraction. All of the Hanford Site tank wastes can benefit from calcination/dissolution processing, contingent upon blending various tank waste types to ensure a target of 70 wt% sodium hydroxide/nitrate/nitrite fluxing agent. Finally, corrosion testing indicates that a jacketed nickel liner cooled to below 400 C would corrode <2 mil/year (0.05 mm/year) from molten calcine attack.

2934 (WHC-SD-WM-ES-333) Clean salt disposition options. Herting, D.L. (International Technology Corp., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); International Technology Corp., Richland, WA (United States). 29 Mar 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010142. Source: OSTI; NTIS; INIS; GPO Dep.

The proposed waste treatment scheme known as the "Clean Salt Process" would make it possible to extract sodium salts of very low specific activity from Hanford's low level waste currently stored in underground single shell and double shell tanks. This document explores the regulations applicable to a number of disposition options for the recovered sodium salts. The current (baseline) plan is to vitrify the unrecovered sodium salts along with the low level waste from the tanks. Several options are available for disposition of the recovered salts, at far less cost. These options range from beneficial re-use or recycle of the recovered salts to disposal of the recovered salts as mixed waste at an on-site

disposal facility. Federal and state regulations governing each disposition option are presented.

2935 (WHC-SD-WM-TI-643) Significant volume reduction of tank waste by selective crystallization: 1994 Annual report. Herting, D.L.; Lunsford, T.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001408. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this technology task plan is to develop and demonstrate a scaleable process of reclaim sodium nitrate (NaNO_3) from Hanford waste tanks as a clean nonradioactive salt. The purpose of the so-called Clean Salt Process is to reduce the volume of low level waste glass by as much as 70%. During the reporting period of October 1, 1993, through May 31, 1994, progress was made on four fronts — laboratory studies, surrogate waste compositions, contracting for university research, and flowsheet development and modeling. In the laboratory, experiments with simulated waste were done to explore the effects of crystallization parameters on the size and crystal habit of product NaNO_3 crystals. Data were obtained to allow prediction of decontamination factor as a function of solid/liquid separation parameters. Experiments with actual waste from tank 101-SY were done to determine the extent of contaminant occlusions in NaNO_3 crystals. In preparation for defining surrogate waste compositions, single shell tanks were categorized according to the weight percent NaNO_3 in each tank. A detailed process flowsheet and computer model were created using the ASPENPlus steady state process simulator. This is the same program being used by the Tank Waste Remediation System (TWRS) program for their waste pretreatment and disposal projections. Therefore, evaluations can be made of the effect of the Clean Salt Process on the low level waste volume and composition resulting from the TWRS baseline flowsheet. Calculations, using the same assumptions as used for the TWRS baseline where applicable indicate that the number of low level glass vaults would be reduced from 44 to 16 if the Clean Salt Process were incorporated into the baseline flowsheet.

2936 (WSRC-MS-94-0197) A parallel plate electrochemical reactor model for the destruction of nitrate and nitrite in alkaline waste solutions. Hobbs, D.T. (Westinghouse Savannah River Co., Aiken, SC (United States)); Coleman, D.H.; White, R.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940529-11: 185. Electrochemical Society meeting, San Francisco, CA (United States), 22-27 May 1994). Order Number DE94010819. Source: OSTI; NTIS; GPO Dep.

The nitrate and nitrite species present in liquid radioactive waste solutions must be destroyed before permanent disposal of the waste can be accomplished. This process can simultaneously remove hazardous compounds and reduce the volume of the waste. A divided cell parallel plate electrochemical reactor model with multiple reactions at both electrodes and a recirculation tank was developed to simulate the reduction of nitrate and nitrite in alkaline solutions. Since many gases are produced in the process, a flash calculation is used in the model to predict the off gas composition. The gases are assumed to stay in solution in the reactor and are flashed after passing through the reactor. Predictions of the off gas composition, the liquid free composition, reaction

current efficiencies, and other quantities of interest for each species versus time or charge passed will be presented.

2937 (WSRC-MS-94-0203P) Characterization of high-level waste saltcake stored at the Savannah River Site. Hobbs, D.T.; Coleman, C.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940813-35: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95005885. Source: OSTI; INIS; NTIS; GPO Dep.

Approximately 34 million gallons of high-level nuclear waste (HLW) are stored at the Savannah River Site (SRS) in 51 underground storage tanks. Facilities have been constructed to permanently dispose of this waste. The radioactive components will be separated from the bulk of the waste into a small volume fraction and vitrified in the Defense Waste Processing Facility (DWPF). The remaining, much larger volume fraction will be incorporated into a cement waste form in the Saltstone facility. Most of the radioactivity in the HLW is present in a solids fraction referred to as sludge. These solids are produced upon addition of sodium hydroxide to the acidic waste solutions to provide a highly alkaline slurry. The highly alkaline condition is necessary to prevent corrosion of the carbon steel storage tanks. After allowing the sludge solids to settle, the waste solutions are decanted and evaporated to conserve storage space in the tanks. Upon cooling, salts are crystallized from the evaporated wastes. The crystallized salts are referred to as saltcake.

2938 (WSRC-MS-94-0214P) A simple model of the batch electrochemical reduction of nitrate/nitrite waste. Wingard, D.A. (South Carolina Univ., Columbia, SC (United States). Dept. of Chemical Engineering); Weidner, J.W.; Van Zee, J.W.; Hobbs, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940529-23: 185. Electrochemical Society meeting, San Francisco, CA (United States), 22-27 May 1994). Order Number DE94016693. Source: OSTI; NTIS; INIS; GPO Dep.

A model of a divided parallel plate electrochemical cell operated in a batch mode for the destruction of $\text{NO}_3^-/\text{NO}_2^-$ in alkaline waste streams is presented. The model uses boundary layer approximations at each electrode and at the separator to minimize computation time. Five competing electrochemical reactions are included at the cathode. The model uses either an explicit Runge-Kutta routine with empirically determined current efficiencies or an implicit stepping routine for each electrode if the current efficiencies are to be predicted. Time dependent changes of the concentration, temperature, and cell voltage are predicted for constant current operation. Model predictions are compared with experimental data.

2939 (WSRC-RP-94-1272) Cesium cobalt dicarbonyl solubility, precipitation, and reactivity in basic aqueous solution. McCabe, D.J.; Fanning, J.C.; Hugg, L.A.; Smith, W.A.; Terrell, A.S.; Yasinsac, L.; Todd, L.J.; Jasper, S.A. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005881. Source: OSTI; NTIS; INIS; GPO Dep.

The title compound, $\text{Cs}^+[\text{Co}((3-1,2-\text{C}_2\text{B}_9\text{H}_{11})_2)^- (\text{CsCDC})$, was precipitated with a NaCDC solution from solutions containing CsCl. The reaction was followed by measuring loss of light intensity as the precipitate formed. The $[\text{Cs}^+]$ and $[\text{CDC}^-]$ at the point of precipitation were estimated and approximate values of the K_{sp} for CsCDC determined at room temperature: 8×10^{-6} (water), 7×10^{-6} (1 M NaOH), and 2×10^{-6} (5M NaCl/0.1 M KOH/1.0 M NaOH). In some cases, NaCDC precipitated from solution when added to the latter salt solution. For the medium, 5 M NaNO_3 /0.1 M KOH/1.0 M NaOH a four-fold excess of NaCDC was added to a 10mM Cs^+ solution at 40°C and the $[\text{CDC}^-]$ measured spectrophotometrically. Only CsCDC precipitated, and a K_{sp} of 3.9×10^{-6} was determined. The solubilities of CsCDC were measured in NaNO_3 and NaCl solutions at 30°C as a function of the Na salt concentration. Reaction of the CDC^- with OH^- slowly produces $\text{B}(\text{OH})_4^-$, H_2 , and $\text{CoO}(\text{OH})$. Reaction of 22 μM CsCDC with 1M NaOH has a first order rate constant at 56°C of $8.8 \times 10^{-7} \text{ s}^{-1}$, while that for 14 mM NaCDC is $7.2 \times 10^{-7} \text{ s}^{-1}$. Activation energy for the reaction is 110 kJ.

2940 (WSRC-TR-93-454) Solubility of uranium in alkaline salt solutions. Hobbs, D.T.; Edwards, T.B. Westinghouse Savannah River Co., Aiken, SC (United States). 29 Mar 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94015556. Source: OSTI; NTIS; INIS; GPO Dep.

The solubility of uranium in alkaline salt solutions was investigated to screen for significant factors and interactions among the major salt components and temperature. The components included in the study were the sodium salts of hydroxide, nitrate, nitrite, aluminate, sulfate, and carbonate. General findings from the study included: (1) uranium solubilities are very low (1-20 mg/L) for all solution compositions at hydroxide concentrations from 0.1 to 17 molar (2) carbonate, sulfate, and aluminate are not effective complexants for uranium at high hydroxide concentration, (3) uranium solubility decreases with increasing temperature for most alkaline salt solutions, and (4) uranium solubility increases with changes in solution chemistry that reflect aging of high level waste (increase in nitrite and carbonate concentrations, decrease in nitrate and hydroxide concentrations). A predictive model for the concentration of uranium as a function of component concentrations and temperature was fitted to the data. All of the solution components and temperature were found to be significant. There is a significant lack of fit for the model, which suggests that the dependence on the uranium solubility over the wide range of solution compositions is non-linear and/or that there are other uncontrolled parameters which are important to the uranium solubility.

2941 (WSRC-TR-94-0269) Nuclear criticality safety evaluation of the passage of decontaminated salt solution from the ITP filters into tank 50H for interim storage. Hobbs, D.T.; Davis, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). 27 May 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94015549. Source: OSTI; NTIS; INIS; GPO Dep.

This report assesses the nuclear criticality safety associated with the decontaminated salt solution after passing through the In-Tank Precipitation (ITP) filters, through the stripper columns and into Tank 50H for interim storage until transfer to the Saltstone facility. The criticality safety basis for the ITP process is documented. Criticality safety in the ITP filtrate has been analyzed under normal and process

upset conditions. This report evaluates the potential for criticality due to the precipitation or crystallization of fissionable material from solution and an ITP process filter failure in which insoluble material carryover from salt dissolution is present. It is concluded that no single inadvertent error will cause criticality and that the process will remain subcritical under normal and credible abnormal conditions.

2942 (WSRC-TR-94-0286) Composition of simulants used in the evaluation of electrochemical processes for the treatment of high-level wastes. Hobbs, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94017805. Source: OSTI; NTIS; INIS; GPO Dep.

Four simulants are being used in the evaluation of electrochemical processes for the treatment of high-level wastes (HLW). These simulants represent waste presently stored at the Hanford, Idaho Falls, Oak Ridge, and Savannah River sites. Three of the simulants are highly alkaline salt solutions (Hanford, Oak Ridge, and Savannah River), and one is highly acidic (Idaho Falls).

2943 (WSRC-TR-94-0287) Summary technical report on the electrochemical treatment of alkaline nuclear wastes. Hobbs, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Jul 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95000759. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the laboratory studies investigating the electrolytic treatment of alkaline solutions carried out under the direction of the Savannah River Technology Center from 1985-1992. Electrolytic treatment has been demonstrated at the laboratory scale to be feasible for the destruction of nitrate and nitrite and the removal of radioactive species such as ^{99}Tc and ^{106}Ru from Savannah River Site (SRS) decontaminated salt solution and other alkaline wastes. The reaction rate and current efficiency for the removal of these species are dependent on cell configuration, electrode material, nature of electrode surface, waste composition, current density, and temperature. Nitrogen, ammonia, and nitrous oxide have been identified as the nitrogen-containing reaction products from the electrochemical reduction of nitrate and nitrite under alkaline conditions. The reaction mechanism for the reduction is very complex. Voltammetric studies indicated that the electrode reactions involve surface phenomena and are not necessarily mass transfer controlled. In an undivided cell, results suggest an electrocatalytic role for oxygen via the generation of the superoxide anion. In general, more efficient reduction of nitrite and nitrate occurs at cathode materials with higher overpotentials for hydrogen evolution. Nitrate and nitrite destruction has also been demonstrated in engineering-scale flow reactors. In flow reactors, the nitrate/nitrite destruction efficiency is improved with an increase in the current density, temperature, and when the cell is operated in a divided cell configuration. Nafion® cation exchange membranes have exhibited good stability and consistent performance as separators in the divided-cell tests. The membranes were also shown to be unaffected by radiation at doses approximating four years of cell operation in treating decontaminated salt solution.

2944 Separation and preconcentration of metal ions from acidic media by extraction chromatography. Dietz, M.L. (Argonne National Lab., IL (United States)); Horwitz,

E.P.; Chiarizia, R.; Diamond, H.; Rhoads, S. pp. 704, Paper I&EC 20 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813--: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Substantial progress has recently been made in the development of efficient and selective liquid-liquid extraction processes for the isolation of various radionuclides from nuclear waste streams. With minor modification, these processes can be adapted to produce new extraction chromatographic materials capable of selectively sorbing any of a variety of metal ions from biological, geological, and environmental samples. The relationship between waste processing chemistry and extraction chromatography is explored and selected applications of the new chromatographic materials are described.

2945 Washing and caustic leaching of Hanford tank sludges. Lumetta, G.J. (Pacific Northwest Lab., Richland, WA (United States)); Rapko, B.M.; Colton, N.G. pp. 719, Paper I&EC 71 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813--: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Methods are being developed to treat and dispose of large volumes of radioactive wastes stored in underground tanks at the U.S. Department of Energy's Hanford Site. The wastes will be partitioned into high-level waste (HLW) and low-level waste (LLW) fractions. The HLW will be vitrified into borosilicate glass and disposed of in a geologic repository, while the LLW will be immobilized in a glass matrix and will likely be disposed of by shallow burial at the Hanford Site. The wastes must be pretreated to reduce the volume of the HLW fraction, so that vitrification and disposal costs can be minimized. The current baseline process for pretreating Hanford tank sludges is to leach the sludge under caustic conditions, then remove the solubilized components of the sludge by water washing. Tests of this method have been performed with samples taken from several different tanks at Hanford. The results of these tests are presented in terms of the composition of the sludge before and after leaching. X-ray diffraction and scanning electron microscopy coupled with electron dispersive x-ray techniques have been used to identify the phases in the untreated and treated sludges.

2946 Laboratory testing of ozone oxidation of Hanford site waste. Delegard, C.H. (Westinghouse Hanford Co., Richland, WA (United States)); Stubbs, A.M.; Bolling, S.D.; Colby, S.A. pp. 720, Paper I&EC 72 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813--: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Organic constituents in radioactive waste stored in underground tanks at the U.S. Department of Energy's Hanford Site provoke safety concerns arising from their low-temperature reactions with nitrate and nitrite oxidants. Destruction of the organics would eliminate both safety problems. Oxone oxidation was investigated to destroy organic species present in simulated and genuine waste from Hanford Site Tank 241-SY-101. Bench-scale tests showed high-shear mixing apparatus achieved efficient gas-to-solution mass transfer and utilization of the ozone reagent. Oxidations of nitrite (to form nitrate) and organic species were observed. The organics formed carbonate and oxalate as well as nitrate and nitrogen gas from organic nitrogen.

Formate, acetate and oxalate were present both in source waste and as reaction intermediates. Metal species oxidations also were observed directly or inferred by solubilities. Chemical precipitations of metal ions such as strontium and americium occurred as the organic species were destroyed by ozone. Reaction stoichiometries were consistent with the reduction of one oxygen atom per ozone molecule.

2947 Ion-exchange performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants. Klavetter, E.A. (Sandia National Labs., Albuquerque, NM (United States)); Brown, N.E.; Trudell, D.; Anthony, R.G.; Gu, D.; Thibaud-Erkey, C. pp. 721, Paper I&EC 77 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813--: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

A new class of inorganic ion exchangers, called crystalline silicotitanates (CSTs), has been prepared at Sandia National Laboratories and Texas A&M University. CSTs have high selectivity for the adsorption of Cs, Sr, and other radionuclides from highly alkaline, high-sodium supernate such as those found at the Hanford Site. The applicability of CSTs to remove Cs and other radionuclides have been assessed for treating Hanford tank wastes using continuous-flow, ion-exchange columns. This paper presents tests results which address chemical, physical, and radiological properties which are expected to be relevant for Hanford radwaste processing. Results indicate that CSTs have a large distribution coefficient ($K_d > 2000$ mL/g in NCAW simulants) for adsorbing ppm concentrations of Cs. CSTs exhibit very high K_d values ($> 20,000$ mL/g) for Cs in neutral pH solutions and K_d values of > 2000 mL/g in solutions containing 2M HNO₃. Results are presented from initial experimental efforts that describe the potential performance of the CSTs in laboratory-scale ion-exchange columns. Included are results showing the stability of the CST material in basic solutions and in radiation doses up to 10^9 rads (Si).

2948 Electrochemical treatment of alkaline nuclear wastes. Hobbs, D.T. (Westinghouse Savannah River Co., Aiken, SC (United States)). pp. 722, Paper I&EC 79 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813--: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Production of nuclear materials within the DOE complex has produced large volumes of high-level waste (HLW) containing hazardous species such as nitrate, nitrite, chromium, and mercury. Some of the waste also contains large amounts of organic complexants and degradation products, which presents safety concerns due to the formation of flammable gases. It has been estimated that 250 million kilograms of sodium nitrate are stored in HLW throughout the DOE complex, primarily as alkaline wastes solutions and slurries. Processes being developed for the permanent disposal of these wastes are focused on separating the bulk of the radioactivity, primarily cesium-137 and strontium-90, into a smaller volume for incorporation into a vitrified wasteform, with the remainder being incorporated into a low-level, high-volume cement wasteform. Electrochemical treatment of the HLW is one of the candidate technologies being evaluated for the destruction of nitrate, nitrite and organic compounds as well as for the removal of radionuclides and hazardous metals from the different wastes. Previous testing has investigated the destruction of nitrate and nitrite in laboratory-scale flow reactors with non-radioactive simulated

salt solutions. Results of testing with actual waste from the Savannah River Site in flow reactors are presented.

2949 Flow sheet development for the remediation of tank SY-102 at the Hanford Nuclear Reservation. Yarbrow, S.L. (Los Alamos National Lab., NM (United States)); Punjak, W.A.; Schreiber, S.B.; Ortiz, E.M.; Jarvinen, G.D. pp. 724, Paper I&EC 85 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

The U.S. Department of Energy established the Tank Waste Remediation System (TWRS) to safely manage and dispose of radioactive waste stored in underground tanks at the Hanford Nuclear Reservation. A major task of TWRS is to separate tank wastes into high-level and low-level fractions. This separation is important because of the enormous costs associated with handling high-level waste and the limited repository space that is available. Due to their high activity, segregating the actinides and fission products from the bulk of the waste is required to achieve this goal. As a part of this program, personnel at the Los Alamos National Laboratory have developed and demonstrated a flow sheet to remediate tank SY-102 at the Hanford Site. This presentation documents the results of the flow sheet demonstrations performed with simulated, but radioactive, wastes using an existing glovebox line at the Los Alamos Plutonium Facility. Removal of the actinides from a high-salt, low-acid feed by ion exchange is the key unit operation. The flow sheet produces relatively low waste volumes, can be accomplished with conventional chemical processing equipment, and takes advantage of the components of the waste to increase the efficiency of the TRU elements recovery.

2950 Characterization of high-level waste saltcake stored at the Savannah River site. Hobbs, D.T. (Westinghouse Savannah River Co., Aiken, SC (United States)); Coleman, C.J. pp. 726, Paper I&EC 91 of 208th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2072 (CONF-940813-: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994).

Since startup of the Savannah River Site over forty years ago, high-level waste from the processing of nuclear materials has been stored in large underground tanks. To reduce the volume of waste for storage, the alkaline solutions are evaporated and cooled resulting in the crystallization of salts. The crystallized salts are referred to as saltcake. Facilities have been constructed to permanently dispose of the waste. Saltcake will be dissolved in water, transferred to specially-modified waste tanks for chemical processing, and treated to remove radionuclides. This decontamination process is referred to as the In-Tank Precipitation process. Samples from the first tank of saltcake that will be processed have been obtained and analyzed to determine the chemical and radiochemical composition. The results and impacts on the In-Tank Precipitation process are presented.

2951 Selective chelators for actinide complexation. Huber, V.J. (New Mexico State Univ., Las Cruces, NM (United States)); Koshti, N.; Gopalan, A.S.; Jarvinen, G.D.; Smith, P.H. pp. 767, Paper I&EC 176 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The removal of actinide contamination from environmental and industrial waste waters is a complex problem because of the low levels that must be achieved. Typically the actinide concentration is low relative to potential competing metal ions. The authors are developing selective chelators and chelating polymers for removal of actinides from aqueous media. The design and synthesis of a series of hydroxamic acid chelators allows for a systematic study of the key parameters controlling metal ion selectivity. The authors have synthetically varied the cavity size, geometry and chelate denticity and have measured the binding constants for thorium(IV) and iron(III) using potentiometric titration. Through these chemical variations the authors have succeeded in preparing a system which preferentially binds thorium(IV) over iron(III). Molecular mechanics studies are in progress to determine if this technique can be used to predict the observed selectivity.

2952 Plutonium and americium separation using organophosphorus extractant absorbed onto ferromagnetic particle. Nunez, L. (Chemical Technology, Argonne, IL (United States)); Vandegrift, G.F. pp. 776-777, Paper I&EC 214 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

Polymeric coated ferromagnetic particles with an absorbed layer of octyl(phenyl)-N, N-diisobutylcarbamoylmethylphosphine oxide (CMPO) diluted by tributyl phosphonate (TBP) are being evaluated for application in the separation and the recovery of low concentrations of americium and plutonium from nuclear waste solutions. Due to their chemical nature, these extractants selectively complex americium and plutonium contaminants onto the particles, which can be recovered from the solution using a magnet. Physical and chemical characterization of the extractant-absorbed particles were performed by gamma-ray and liquid scintillation counting, scanning electron microscopic (SEM) micrograph, energy disperse spectroscopy (EDS), and magnetic susceptibility measurements. Plutonium and americium separations have been performed at various nitric acid concentrations. Parameters such as absorbed layer thickness and separation abilities are studied to determine the limitations and capacity of the process. The status of the chemistry and application of the process to DOE remediation efforts for actinide decontamination are discussed.

2953 Polymer pendant ligand chemistry: A biomimetic chemistry approach to metals removal and recovery from aqueous environmental solutions. Fish, R.H. (Univ. of California, Berkeley, CA (United States)); Huang, S.; Li, W.; Albright, R.L.; Fries, W. pp. 778, Paper I&EC 218 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The use of polymer pendant ligands to selectively remove and recover metal ions from aqueous solutions will be an important remediation technique for the Department of Energy's (DOE) Environmental Management and Restoration program goals. The authors have initiated studies that will develop new polymer pendant ligands that are biomimics of known biological ligands that selectively complex metal ions. The authors present results on the synthesis of polymer

pendant sulfonated catechol (CATS) and sulfonated 3,3 and 3,4-linear catechol amide (3,3 and 3,4-LICAMS) ligands and their selective reactions with Fe^{3+} , Cu^{2+} , Zn^{2+} , Ni^{2+} , Hg^{2+} , etc. ions at various pH values. Kinetic studies for rates of metal ion removal as a function of pH and the rates of regeneration of the polymer pendant ligand site for the recovery of these metal ions is also presented.

2954 The synthesis, characterization and structure of chlorinated derivatives of the cobalt dicarbollide anion. Hurlburt, P. (Los Alamos National Lab., NM (United States)); Kinkead, S.A.; Foreman, T.M. pp. 928, Paper INOR 507 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 (CONF-940301-; 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The cobalt dicarbollide anion, $[\text{Co}(\text{C}_2\text{B}_9\text{H}_{11})_2]^-$, is unique in its ability to separate Cs^+ from other cations, an important property in the remediation of nuclear waste. Its natural resistance to radiolytic degradation is increased by chlorination of the carborane cages. The boron atoms of cobalt dicarbollide are chlorinated upon treatment with elemental chlorine or hypochlorous acid. The degree of chlorination can be controlled by varying the reaction conditions. The syntheses and characterizations of these compounds are presented.

2955 Mercury extraction by the TRUEX process solvent. I. Kinetics, extractable species, and dependence on nitric acid concentration. Herbst, R.S. (Westinghouse Idaho Nuclear Co., Inc., ID (United States)); Brewer, K.N.; Tranter, T.J.; Todd, T.A. *Solvent Extraction and Ion Exchange (United States)*; 13(3): 431-446 (May 1995).

Mercury extraction from acidic aqueous solutions by the TRUEX process solvent (0.2 M CMPO - 1.4 M TBP in *n*-dodecane) has not extensively been examined. Preliminary experiments were performed involving the extraction of Hg^{203} , added as HgCl_2 , from 0.01 to 10 M HNO_3 solutions. Mercury distribution coefficients (D_{Hg}) range between 3 and 60 from 0.01 M to 2 M HNO_3 . At higher nitric acid concentrations, i.e. 5 M HNO_3 or greater, D_{Hg} significantly decreases to values less than 1. These results indicate mercury is extracted from acidic solutions $\leq$ nearly 2 M HNO_3 and stripped with nitric acid solutions $\geq$ nearly 5 M HNO_3 . Experimental results indicate the extractable species is HgCl_2 from nitrate media, i.e., chloride must be present in the nitrate feed to extract mercury. Extractions from $\text{Hg}(\text{NO}_3)_2$ solutions indicated substantially reduced distribution ratios, typically $D_{\text{Hg}} < 1$, for the range of nitric acid concentrations examined (0.01 to 8 M HNO_3). Extraction of mercury, as HgCl_2 , by the individual components of the TRUEX solvent was also examined from 2 M HNO_3 . The diluent, *n*-dodecane, does not measurably extract mercury. With a 1.4 M TBP/*n*-dodecane solvent, D_{Hg} nearly 3.4 compared with D_{Hg} nearly 7 for the TRUEX solvent. 5 refs., 2 figs., 7 tabs.

2956 Extraction of strontium from acidic nitrate media using a modified PUREX solvent. Dietz, M.L. (Argonne National Lab., IL (United States)); Horwitz, E.P.; Rogers, R.D. *Solvent Extraction and Ion Exchange (United States)*; 13(1): 1-17 (Jan 1995). DOE Contract W-31109-ENG-38.

A new process for the extraction and recovery of strontium from acidic waste streams is described. In this process, a modification of the previously described SREX (for strontium extraction) process, strontium is extracted from acidic (≥ 2 M nitric acid) solution using a 0.2 M solution of di-*t*-butylcyclohexano-18-crown-6 in any of a variety of phase

modifier/paraffinic hydrocarbon mixtures, among them a PUREX-like diluent comprised of a 1.2 M solution of tri-*n*-butyl-phosphate in Isopar L. Tests of this process solvent on a synthetic dissolved sludge waste show that only strontium and barium are appreciably extracted by the crown ether under the experimental conditions. As expected, uranium and plutonium are extracted even in the absence of the crown ether. 17 refs., 4 figs., 4 tabs.

2957 Extraction of transuranic elements with a dihexyl-*n,n*-diethylcarbamoylmethyl phosphonate/tributyl phosphate system - Initial investigations. Rapko, B.M. (Pacific Northwest Lab., Richland, WA (United States)); Lumetta, G.J. *Solvent Extraction and Ion Exchange (United States)*; 12(5): 967-986 (Oct 1994). DOE Contract AC06-76RL01830.

An extractant system, 0.75 M DHDECMP and 1 M TBP in an aliphatic hydrocarbon diluent, was evaluated for selectively removing transuranic elements (TRUs) from acidic waste streams. The evaluation involved six parts. The results are discussed along with their consequences with respect to developing a flowsheet for processing wastes stored at the US Department of Energy's Hanford site. 28 refs., 8 figs.

2958 Uptake of metal ions by a new chelating ion-exchange resin. Part 5. The effect of solution matrix on actinides. Horwitz, E.P. (Argonne National Lab., IL (United States)); Chiarizia, R.; Alexandratos, S.D. *Solvent Extraction and Ion Exchange (United States)*; 12(4): 831-845 (Aug 1994).

The influence of commonly occurring matrix constituents on the uptake of representative actinides in the tri-, tetra-, and hexavalent oxidation states by a new chelating ion-exchange resin, called Diphonix, has been investigated. The effect of increasing concentrations of HF at three fixed HCl concentrations on the retention of U(VI), Np(IV), and Am(III) was measured. All three actinides showed strong retention in HF even up to a concentration of 1 M. The effect of sulfuric, oxalic and phosphoric acids at three fixed HNO_3 concentrations on the retention of Th(IV), U(VI), and Am(III) was also measured. Only when the concentration of the complexing acids was above 0.1 M was the retention of the actinides decreased significantly at 0.1 M HNO_3 . The effect was much less pronounced at higher HNO_3 concentrations. Sodium, calcium, aluminum and iron were selected to study the influence of cationic matrix constituents on the uptake of actinide ions by Diphonix. In the case of tetra- and hexavalent actinides (represented by Th and U, respectively) only the very highest concentrations of Fe(III) and Al(III) caused a significant decrease in the retention of the two higher valent actinides. On the other hand, Am(III) retention was significantly lowered by Al and Fe(III) concentrations above 10^{-2} M. 5 refs., 12 figs.

2959 Uptake of metal ions by a new chelating ion-exchange resin. Part 6. Calculations on the effect of complexing anions on actinides. Chiarizia, R. (Argonne National Lab., IL (United States)); Horwitz, E.P. *Solvent Extraction and Ion Exchange (United States)*; 12(4): 847-871 (Aug 1994).

A previous paper reported the effect of increasing concentrations of hydrofluoric, oxalic, sulfuric and phosphoric acids at three fixed HCl or HNO_3 concentrations on the retention of Am(III), Th(IV) or Np(IV), and U(VI) by the new chelating ion-exchange resin Diphonix. In this paper the metal uptake data have been analyzed by calculating the effect that complex formation in solution has on the overall metal uptake by

the resin. The calculations performed have allowed us to conclude that in most cases the uptake of Am(III) and U(VI) by Diphonix can be explained by assuming that only the uncomplexed metal cation is sorbed. With tetravalent actinides, on the contrary, the uptake data can only be explained if the simultaneous sorption of the uncomplexed cation and of neutral metal complexes is assumed. Indirect evidence has also been obtained on the existence of anionic fluoride complexes of Np(IV). In all other cases, with minor exceptions, the complex formation data available in the literature seem to describe accurately the behavior of the investigated systems. 13 refs., 6 figs., 4 tabs.

2960 Removal of VOCs from groundwater using membrane-assisted solvent extraction. Hutter, J.C. (Argonne National Lab., IL (United States). Chemical Technology Div.); Vandegrift, G.F.; Nunez, L.; Redfield, D.H. *AIChE Journal (American Institute of Chemical Engineers) (United States)*; 40(1): 166-177 (Jan 1994). DOE Contract W-31109-ENG-38.

A membrane-assisted solvent extraction (MASX) system coupled to a membrane-assisted distillation stripping (MADS) system for use in decontaminating groundwater is evaluated. Volatile organic compounds (VOCs) in the groundwater are extracted in the MASX unit using a sunflower oil solvent. In the MADS unit, VOCs are stripped from the sunflower oil, which is recycled to the MASX unit. Thermodynamic data for the sunflower oil-water-VOCs system were measured. The results were used along with published membrane mass-transfer data to design MASX and MADS modules.

2961 Separations of actinides, lanthanides and other metals. Smith, B.F.; Jarvinen, G.D.; Ensor, D.D. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,409,678/A. 25 Apr 1995. Filed date 11 Mar 1993. U.S. Patent Application 8-031,053. Int. Cl. C01G 1/00; C01F 1/00. [10p.] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An organic extracting solution comprised of a bis(acylpyrazolone) or a substituted bis(acylpyrazolone) and an extraction method are disclosed useful for separating certain elements of the actinide series of the periodic table having a valence of four from one other, and also from one or more of the substances in a group consisting of hexavalent actinides, trivalent actinides, trivalent lanthanides, trivalent iron, trivalent aluminum, divalent metals, and monovalent metals and also useful for separating hexavalent actinides from one or more of the substances in a group consisting of trivalent actinides, trivalent lanthanides, trivalent iron, trivalent aluminum, divalent metals, and monovalent metals. 7 figs.

2962 Process for the extraction of strontium from acidic solutions. Horwitz, E.P.; Dietz, M.L. To Dept. of Energy, Washington, DC (United States). U.S. Patent 5,344,623/A. 6 Sep 1994. Filed date 15 Jun 1993. U.S. Patent Application 8-076,881. Int. Cl. C01F 13/00. [10p.] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The invention is a process for selectively extracting strontium values from aqueous nitric acid waste solutions containing these and other fission product values. The extractant solution is a macrocyclic polyether in an aliphatic hydrocarbon diluent containing a phase modifier. The process will selectively extract strontium values from nitric acid solutions which are up to 6 molar in nitric acid. 4 figs.

2963 Liquid chromatographic extraction medium. Horwitz, E.P.; Dietz, M.L. To ARCH Development Corp., Chicago, IL (United States). U.S. Patent 5,346,618/A. 13 Sep 1994. Filed date 23 Apr 1993. U.S. Patent Application 8-051,608. Int. Cl. B01D 15/08. [10p.] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A method and apparatus are disclosed for extracting strontium and technetium values from biological, industrial and environmental sample solutions using a chromatographic column. An extractant medium for the column is prepared by generating a solution of a diluent containing a Crown ether and dispersing the solution on a resin substrate material. The sample solution is highly acidic and is introduced directed to the chromatographic column and strontium or technetium is eluted using deionized water. 1 fig.

2964 Method for the concentration and separation of actinides from biological and environmental samples. Horwitz, E.P.; Dietz, M.L. To Arch Development Corp., Chicago, IL (United States). U.S. Patent 4,835,107/A. 30 May 1989. Filed date 21 Oct 1986. U.S. Patent Application 6-921,282. Int. Cl. G01N 33/20; G01N 30/02; B01D 11/00. [10p.] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A method and apparatus for the quantitative recover of actinide values from biological and environmental sample by passing appropriately prepared samples in a mineral acid solution through a separation column of a dialkyl(phenyl)-N,N-dialkylcarbamoylmethylphosphine oxide dissolved in tri-n-butyl phosphate on an inert substrate which selectively extracts the actinide values. The actinide values can be eluted either as a group or individually and their presence quantitatively detected by alpha counting. 3 figs.

2965 Method for extracting lanthanides and actinides from acid solutions by modification of Purex solvent. Horwitz, E.P.; Kalina, D.G. To Dept. of Energy, Washington, DC (United States). U.S. Patent 4,574,072/A. 4 Mar 1986. Filed date 21 May 1984. U.S. Patent Application 6-612,199. Int. Cl. B01D 11/04; C01F 17/00; C22B 59/00; C01G 56/00. [10p.] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A process is described for the recovery of actinide and lanthanide values from aqueous solutions with an extraction solution containing an organic extractant having the formula as shown in a diagram where ϕ is phenyl, R^1 is a straight or branched alkyl or alkoxyalkyl containing from 6 to 12 carbon atoms and R^2 is an alkyl containing from 3 to 6 carbon atoms and phase modifiers in a water-immiscible hydrocarbon diluent. The addition of the extractant to the Purex process extractant, tri-n-butylphosphate in normal paraffin hydrocarbon diluent, will permit the extraction of multivalent lanthanide and actinide values from 0.1 to 12.0 molar acid solutions. 6 figs.

2966 Process for recovering actinide values. Horwitz, E.P.; Mason, G.W. To Dept. of Energy, Washington, DC (United States). U.S. Patent 4,208,377/A. 17 Jun 1980. Filed date 25 Jul 1978. Int. Cl. C02B 1/32. [10p.] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A process is disclosed for rendering actinide values recoverable from sodium carbonate scrub waste solutions

containing these and other values along with organic compounds resulting from the radiolytic and hydrolytic degradation of neutral organophosphorous extractants such as tri-*n* butyl phosphate (TBP) and dihexyl-N,N-diethyl carbamylmethylene phosphonate (DHDECAMP) which have been used in the reprocessing of irradiated nuclear reactor fuels. The scrub waste solution is preferably made acidic with mineral acid, to form a feed solution which is then contacted with a water-immiscible, highly polar organic extractant which selectively extracts the degradation products from the feed solution. The feed solution can then be processed to recover the actinides for storage or recycled back into the high-level waste process stream. The extractant is recycled after stripping the degradation products with a neutral sodium carbonate solution. 1 fig.

TECHNOLOGY INTEGRATION AND INTERNATIONAL TECHNOLOGY EXCHANGE

Refer also to citation(s) 11, 213, 222, 1849, 2927

2967 (ANL/CMT/CP-83059) Technology applications for radioactive waste minimization. Devgun, J.S. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940815-61: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94015036. Source: OSTI; NTIS; INIS; GPO Dep.

The nuclear power industry has achieved one of the most successful examples of waste minimization. The annual volume of low-level radioactive waste shipped for disposal per reactor has decreased to approximately one-fifth the volume about a decade ago. In addition, the curie content of the total waste shipped for disposal has decreased. This paper will discuss the regulatory drivers and economic factors for waste minimization and describe the application of technologies for achieving waste minimization for low-level radioactive waste with examples from the nuclear power industry.

2968 (ANL/EA/CP-84367) How technology is improving decision making for environmental restoration. Ditmars, J. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9411181-1: Earthcare conference, Toulouse (France), 8-10 Nov 1994). Order Number DE95005851. Source: OSTI; NTIS; GPO Dep.

Environmental restoration, or the cleanup of contaminants from past activities, at its core depends on a series of decisions about the nature and extent of contamination, the risk to human health and the environment, and the potential effectiveness of remediation techniques and technologies to reduce the risk to acceptable levels. The effectiveness with which these decisions are made has significant impacts on the cost and duration of the cleanup efforts. The decisions must often be made on the basis of incomplete and uncertain data. Emerging environmental information and data acquisition technologies together with appropriate strategies to support decision making are beginning to change the way environmental restoration occurs in the United States. Past environmental restoration activities too often relied on prescriptive data collection activities to generate the information

upon which decisions were to be made. Retrospective studies of such activities have shown that, while often data were gathered for the purpose of reducing the risk in decision making, little true reduction in risk was realized and large amounts of resources were consumed. Recent examination of the failures in the United States to achieve many complete cleanups despite the investment of large sums and time points to the inability to have decisions made efficiently. The solution to the problem involves both regulatory change to allow more flexibility in decision-making and the introduction of technology to improve decision making. This paper reviews the recent assessments made of the cleanup process and application of strategies and technologies to enhance decision-making for cleanup. It provides examples of the new decision approaches and the technologies that have been employed to speed up characterization and to optimize the implementation of remediation.

2969 (ANL/EA/CP-85788) Training implications of skills needed for environmental cleanup. Young, C. (Argonne National Lab., IL (United States)); Hensley, J.; Lehr, J. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409328-1: Annual meeting of the North American Association for Environmental Education, Cancun (Mexico), 23-27 Sep 1994). Order Number DE95008301. Source: OSTI; NTIS; GPO Dep.

Well-trained staff are needed to perform the diverse tasks associated with environmental cleanup. Although educational and training programs are intended to help professionals learn relevant environmental skills, these programs may or may not be teaching the most appropriate skills. This project investigated the skills needed to carry out environmental activities at a headquarters office of a federal agency. The primary skills needed for environmental cleanup activities emphasize program management, problem solving/critical thinking, and communications. Furthermore, using Bloom's taxonomy of educational objectives, most of these skills fell into the areas of "application" or "evaluation." The results of this investigation suggest that rather than focusing on discipline-specific activities, such as helping improve people's knowledge about regulatory requirements, training and education should emphasize complex problem-solving skills.

2970 (ANL/ITD/CP-83704) Laboratory/industry partnerships for environmental remediation. Beskid, N.J.; Zussman, S.K. Argonne National Lab., IL (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9408160-1: Small business, USDOE contracts and remediation, Kennewick, WA (United States), 9-12 Aug 1994). Order Number DE94018393. Source: OSTI; NTIS; INIS; GPO Dep.

There are two measures of "successful" technology transfer in DOE's environmental restoration and waste management program. The first is remediation of DOE sites, and the second is commercialization of an environmental remediation process or product. The ideal case merges these two in laboratory/industry partnerships for environmental remediation. The elements to be discussed in terms of their effectiveness in aiding technology transfer include: a decision-making champion; timely and sufficient funding; well organized technology transfer function; well defined DOE and commercial markets; and industry/commercial partnering. Several case studies are presented, including the successful commercialization of a process for vitrification

of low-level radioactive waste, the commercial marketing of software for hazardous waste characterization, and the application of a monitoring technique that has won a prestigious technical award. Case studies will include: vitrification of low-level radioactive waste (GTS Duratek, Columbia, MD); borehole liner for emplacing instrumentation and sampling groundwater (Science and Engineering Associates, Inc., Santa Fe, NM); electronic cone penetrometer (Applied Research Associates, Inc., South Royalton, VT); and software for hazardous waste monitoring ConSolve, Inc. (Lexington, MA). The roles of the Department of Energy and Argonne National Laboratory in these successes will be characterized.

2971 Scientific basis for nuclear waste management XVI. Materials Research Society symposium proceedings, Volume 294. Interrante, C.G. (ed.) (Nuclear Regulatory Commission, Washington, DC (United States)); Pabalan, R.T. (ed.). 959p. Materials Research Society, Pittsburgh, PA (United States) (1993). Sponsored by USDOE, Washington, DC (United States); Nuclear Regulatory Commission, Washington, DC (United States). From 16. Materials Research Society (MRS) fall meeting; Boston, MA (United States); 30 Nov - 5 dec 1992.

One most significant aspect of this particular symposium is the focus on the scientific basis for management of nuclear waste. Engineering principles and practices are important, but this symposium focuses on the science. The extension and application of engineering "know how" to waste management problems sometimes requires a degree of understanding not normally needed to solve other engineering problems. In materials science, for example, scientific understandings important to long-term behavior may be obtained from (1) characterizations and analyses of the structure and properties of materials, (2) the recognition of advancements needed to ensure performance, and (3) improvements in methods of fabrication and processing. In addition to the materials science topics addressed here (on waste forms, engineered barrier systems, and the near-field environment), the symposium addressed various far-field topics. The proceedings are divided into the following sections: spent fuel; glass and crystalline waste forms; glass performance—mechanisms and models; cementitious materials; container alteration; microbiologically influenced corrosion; near-field interactions; natural analogues; long-term prediction for engineered barriers; performance assessment of engineered barrier systems; radionuclide chemistry and transport; and performance assessment of geological systems. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

2972 (CONF-9304128—, pp. B.11-B.13) **The Martin Marietta Energy Systems Associated Laboratories for Excellence in Radiation Technology (ALERT).** Bogard, J.S. (Oak Ridge National Lab., TN (United States)); Casson, W.H. Sr.; Bauer, M.L.; Gregory, D.C. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings*. 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The excellence and uniqueness of radiation technology expertise at Oak Ridge National Laboratory (ORNL) was

recognized during a review by the DOE Oak Ridge Field Office prior to a 1990 Tiger Team review, and the Laboratory was encouraged at that time to explore ways of sharing this expertise with other DOE facilities. The subsequent evolution of DOE Laboratory Accreditation Programs, with their challenging performance requirements, and of program guidance such as that contained in the DOE Radiation Control Manual, which requires improved radiological instrument services and encourages standardization, reemphasizes the importance of sharing ORNL's extensive capabilities for supporting improved radiological safety and health programs.

2973 (CONF-9308217—) **Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.** Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. 441p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. Order Number DE94008528. Source: OSTI; NTIS; INIS; GPO Dep.

Scientists, engineers, elected officials, and industry regulators from the United States and Germany met in Albuquerque, New Mexico, August 16–20, 1993, in the first joint international workshop to discuss uranium tailings remediation. Entitled "Workshop on Uranium Production Environmental Restoration: An Exchange between the US and Germany," the meeting was hosted by the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. The goal of the workshop was to further understanding and communication on the uranium tailings cleanup projects in the US and Germany. Many communities around the world are faced with an environmental legacy — enormous quantities of hazardous and low-level radioactive materials from the production of uranium used for energy and nuclear weapons. In 1978, the US Congress passed the Uranium Mill Tailings Radiation Control Act. Title I of the law established a program to assess the tailings at inactive uranium processing sites and provide a means for joint federal and state funding of the cleanup efforts at sites where all or substantially all of the uranium was produced for sale to a federal agency. The UMTRA Project is responsible for the cleanup of 24 sites in 10 states. Germany is facing nearly identical uranium cleanup problems and has established a cleanup project. At the workshop, participants had an opportunity to interact with a broad cross section of the environmental restoration and waste disposal community, discuss common concerns and problems, and develop a broader understanding of the issues. Abstracts are catalogued individually for the data base.

2974 (CONF-9410300—1) **Identifying, meeting, and assessing customer expectations.** Danner, T.A. Oak Ridge National Lab., TN (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 18. annual TRADE conference: customer-driven training on line management expectations; Dallas, TX (United States); 31 Oct - 2 nov 1994. Order Number DE95007365. Source: OSTI; NTIS; INIS; GPO Dep.

Includes viewgraphs.

Maintaining proficiency in carrying out mission goals is fundamental to the success of any organization. The definitive mission of the Waste Management and Remedial Action Division (WMRAD) of Oak Ridge National Laboratory (ORNL) is "to conduct waste management activities in a

compliant, publicly acceptable, technically sound, and cost-efficient manner". In order to effectively fulfill this mission, must meet or exceed several standards in respect to our customers. These include: (1) identifying current and future customer expectations; (2) managing our relationships with our customers; (3) ensuring our commitment to our customers; and (4) measuring our success in customer satisfaction. Our customers have a great variety of requirements and expectations. Many of these are in the form of local, state, and federal regulations and environmental standards. Others are brought to our attention through inquiries made to the Department of Energy (DOE). Consumer surveys have proven to be effective tools which have been used to make improvements, enhance certain program elements, and identify beneficial areas in already existing programs. In addition, national working groups, technology transfer meetings, and manager/contractor's meeting offer excellent opportunities to assess our activities.

2975 (DOE-0227-2-Rev.1) Quality Assurance Plan for Transportation Management Division Transportation Training Programs. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Transportation Management Div. Oct 1994. 72p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003991. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Transportation (DOT) implemented new rules requiring minimum levels of training for certain key individuals who handle, package, transport, or otherwise prepare hazardous materials for transportation. In response to these rules, the U.S. Department of Energy (DOE), Transportation Management Division (TMD), has developed a transportation safety training program. This program supplies designed instructional methodology and course materials to provide basic levels of DOT training to personnel for whom training has become mandatory. In addition, this program provides advanced hazardous waste and radioactive material packaging and transportation training to help personnel achieve proficiency and/or certification as hazardous waste and radioactive material shippers. This training program does not include site-specific or task-specific training beyond DOT requirements.

2976 (DOE-94016533) United States Department of Energy Environmental Management Advisory Board: Public meeting. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 15 Jul 1994. 101p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94016533. Source: OSTI; NTIS; GPO Dep.

This meeting of the Environmental Management Advisory Board was held to discuss environmental concerns that everybody has and to provide a strategy for dealing with the problems. Plans for the Environmental Management Programmatic Environmental Impact Statement are presented. A report is included of the subcommittee on institutional barriers to advanced technology use. The subcommittee on environmental restoration cost effectiveness also presents a report. The status of public involvement activities is evaluated. A presentation on the status of spent fuel management is included.

2977 (DOE/EM-0140P) Environmental Education and Development Division (EM-522): Annual report, Fiscal year 1993. USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington,

DC (United States). Office of Technology Integration and Environmental Education and Development. [1993]. 52p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008620. Source: OSTI; NTIS; GPO Dep.

The Environmental Education and Development Division (EM-522) is one of three divisions within the Office of Technology Integration and Environmental Education and Development (EM-52) in Environmental Restoration and Waste Management's (EM's) Office of Technology Development (EM-50). The primary design criterion for EM-522 education activities is directly related to meeting EM's goal of environmental compliance on an accelerated basis and cleanup of the 1989 inventory of inactive sites and facilities by the year 2019. Therefore, EM-522's efforts are directed specifically toward stimulating knowledge and capabilities to achieve the goals of EM while contributing to DOE's overall goal of increasing scientific, mathematical, and technical literacy and competency. This report discusses fiscal year 1993 activities.

2978 (DOE/EM-0169P, pp. 2-7) Russian separation program. Rea, J.L. (Sandia National Lab., Albuquerque, NM (United States)). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. In *International Technology Exchange Division: 1993 Annual report*. 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

A small contract signed in FY92 with the Khlopin Radium Institute marked the beginning of the Russian Separations program. Under this contract the Khlopin Radium Institute performed laboratory and dynamic hot-cell testing using cobalt dicarbollide technology on simulated radioactive wastes similar to those found at DOE sites in the United States. The current scope of investigation has been extended to identify prospective technologies for application to other United States needs. The Khlopin Radium Institute project served as a model for three other pilot scale technology development projects. The premise of the pilot scale projects is to enable Russian scientists to demonstrate their technology in the context of DOE needs, using Russian technical expertise has proven to be a cost-effective means of screening Russian technologies.

2979 (DOE/EM-0169P, pp. 8-10) Joint Coordinating Committee on environmental restoration and waste management (JCCEM) support, technology transfer, and special projects. Edgar, D.E. (Argonne National Lab., IL (United States)). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. In *International Technology Exchange Division: 1993 Annual report*. 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory (ANL) assisted in identifying and evaluating foreign technologies to meet EM needs; supported the evaluation, removal, and/or revision of barriers to international technology and information transfer/exchange; facilitated the integration and coordination of U.S. government international environmental restoration and waste management activities; and enhanced U.S. industry's competitiveness in the international environmental technology market.

2980 (DOE/EM-0169P, pp. 32-35) Identification of foreign technologies. Rea, J.L. (Sandia National Lab., Albuquerque, NM (United States)). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. In *International Technology Exchange*

Division: 1993 Annual report. 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratory (SNL) identified and evaluated foreign environmental restoration and waste management (ER/WM) technologies for application at specific problem units within the Department of Energy (DOE) Complex.

2981 (DOE/EM-0169P, pp. 46-48) **Program Integration for International Technology Exchange.** Rea, J.L. (Sandia National Lab., Albuquerque, NM (United States)). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. In *International Technology Exchange Division: 1993 Annual report.* 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories (SNL), Albuquerque, New Mexico, supports the International Technology Exchange Division (ITED) through the integration of all international activities conducted within the DOE's Office of Environmental Management (EM).

2982 (DOE/EM-0169P, pp. 49-53) **Central and eastern European activities.** Rea, J.L. (Sandia National Lab., Albuquerque, NM (United States)). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. In *International Technology Exchange Division: 1993 Annual report.* 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

The Florida State University/Technical University of Budapest environmental research center, Center for Hungarian/American Environmental Research, Studies and Exchanges (CHAERSE), provides a resource base for information and technologies that is used to address near- and long-term environmental problems within the Department of Energy (DOE) complex and in Central and Eastern Europe. The CHAERSE is used as a technology transfer conduit for environmental restoration and waste management (ER/WM) problems and solutions. The International Technology Exchange Division (ITED) used the CHAERSE as one source of information for the identification of international ER/WM technologies being developed in Central and Eastern Europe. This was accomplished by matching high-priority problems in that region to high-priority problems in the DOE Complex; conducting symposia, meetings and workshops with international environmental experts; and identifying innovative technologies.

2983 (DOE/EM-0169P, pp. 57) **Review of Hanford International activities.** Panther, D.G. (Westinghouse Hanford, Richland, WA (United States)). USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 1993. In *International Technology Exchange Division: 1993 Annual report.* 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford initiated a review of international activities to collect, review, and summarize information on international environmental restoration and waste management initiatives considered for use at Hanford. This effort focused on Hanford activities and accomplishments, especially international technical exchanges and/or the implementation of foreign-developed technologies.

2984 (DOE/EM-0169P, pp. 60-66) **EnviroTRADE Information system.** Harlan, C. (Sandia National Lab., Albuquerque, NM (United States)); Harrington, M.W. USDOE Assistant Secretary for Environmental Management,

Washington, DC (United States). 1993. In *International Technology Exchange Division: 1993 Annual report.* 79p. Order Number DE94014038. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Technologies for Remedial Actions Data Exchange (EnviroTRADE) is a graphical/textual information management system being developed for the cleanup program of the U.S. Department of Energy's (DOE) Weapons Complex. Its principal purpose is to provide a single, powerful, interactive database that addresses environmental restoration and waste management (ER/WM) problems and the technologies currently under development or already available to resolve them. Because the volume and complexity of the information is so large, a sophisticated Relational Database Management System (RDBMS) is employed in EnviroTRADE. EnviroTRADE will be a multi-purpose, multi-user system capable of addressing a broad range of environmental assessment and cleanup issues. An early focus for the Beta version of EnviroTRADE has been to find matches between specific environmental problems at particular sites (e.g., in terms of waste composition and form) and available and new technologies suited to solve problems. The current prototype EnviroTRADE database includes both U.S. and foreign problems and technologies. A Beta version was developed and demonstrated during FY92 and was expanded in FY93. This system was delivered to EM-523 as a stand-alone resident system for demonstration and feedback purposes. The resident system demonstrates the feasibility of this kind of multi-purpose system and also provides a test bed for refining the system architecture. As the architecture and database grow, an increasing range of possible applications is envisioned. The ability to import very large quantities of graphical, textual, and numerical information into the database is of particular importance. Since a great deal of appropriate data already exists in various electronic formats, a rapid expansion into EnviroTRADE-accessible data is possible without relying on manual entry methods.

2985 (DOE/EM-0196) **EM International, July 1994, Volume 2.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). [1994]. 46p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001103. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Environmental Management (EM) at the Department of Energy (DOE) is seeking out and leveraging foreign technology, data, and resources in keeping with EM's mandate to protect public health and the environment through the safe and cost-effective remediation of the Department's nuclear weapons sites. EM works closely with foreign governments, industry, and universities to obtain innovative environmental technologies, scientific and engineering expertise, and operations experience that will support EM's objectives. Where appropriate, these international resources are used to manage the more urgent risks at our sites, secure a safe workplace, help build consensus on critical issues, and strengthen our technology development program. Through international agreements EM engages in cooperative exchange of information, technology, and individuals. Currently, we are managing agreements with a dozen countries in Europe, Latin America, and Asia. These agreements focus on environmental restoration, waste management, transportation of radioactive wastes, and decontamination and decommissioning. This publication contains the following articles: in situ remediation integrated program; in-situ characterization and inspection of tanks; multimedia environmental pollutant assessment system (MEPAS); LLNL wet oxidation - AEA

technology. Besides these articles, this publication covers: EU activities with Russia; technology transfer activities; and international organization activities.

2986 (DOE/MC/31388-95/C0423) **Environmental management technology demonstration and commercialization.** Jones, M.L.; Beaver, F.W.; Benson, S.A.; Steadman, E.N.; Hawthorne, S.B.; Hurley, J.P.; Ness, R.O. Jr.; Rindt, J.R. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC31388. (CONF-9411149-6: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007346. Source: OSTI; NTIS; GPO Dep.

This document contains several abstracts of talks given to 'Opportunity '95 - Environmental Technology Through Small Business.' Titles include the following: Pyrolysis of Plastic Waste; Subcritical water extraction of organic pollutants and extraction of hazardous metals from mixed solid wastes by chelation and supercritical fluid extraction; extraction and analysis of pollutant organics from contaminated solids using off-line supercritical fluid extraction and on-line SFE/IR; Stabilization of vitrified waste by enhanced crystallization and development of a protocol to predict long-term stability.

2987 (DOE/METC-95/1014) **Proceedings of Opportunity '95 - Environmental technology through small business.** Kothari, V.P. (ed.). USDOE Morgantown Energy Technology Center, WV (United States). Nov 1994. 264p. Sponsored by USDOE, Washington, DC (United States). (CONF-9411149-: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95000040. Source: OSTI; NTIS; INIS; GPO Dep.

The Opportunity '95-Environmental Technology Through Small Business conference was held November 16-17, 1994, at the Morgantown Energy Technology Center (METC) in Morgantown, West Virginia. The overall objective of this conference was to review the latest environmental and waste management technologies being developed under the sponsorship of the Environmental Management-Office of Technology Development (EM-OTD) Program at METC. The focus of this conference was also to address the accomplishments and barriers affecting small businesses, and lay the groundwork for future technology development initiatives and opportunities. Twenty papers were presented in three EM-OTD focus areas: mixed waste characterization, treatment and disposal (6 papers); contaminant plume containment and remediation (6 papers); and facility transitioning, decommissioning and final disposition (8 papers). In addition to the presentations, nine posters of environmental management areas were displayed. A panel discussion was also held on technology development assistance to small businesses. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

2988 (DOE/RL-94-05) **1993 Toxic Chemical Release Inventory: Emergency Planning and Community Right-To-Know Act of 1986, Section 313.** USDOE Richland Operations Office, WA (United States). Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018163. Source: OSTI; NTIS; GPO Dep.

Section 313 of the Emergency Planning and Community Right-To-Know-Act of 1986 (EPCRA) requires the annual

submission of toxic chemical release information to the US Environmental Protection Agency. The following document is the July 1994 submission of the Hanford site EPCRA Toxic Chemical Release Inventory (TRI) Report. Included is a Form R for chlorine, the sole chemical used in excess of the established regulatory thresholds at the Hanford Site by the US Department of Energy, Richland Operations Office and its contractors during Calendar Year 1993. Only those facilities that fall within the Standard Industrial Classification (SIC) code range of 20 through 39 are subject to mandatory reporting under EPCRA, Section 313. However, on August 3, 1993, Executive Order 12856 was signed, requiring all federal agencies and facilities to comply with pollution prevention and emergency planning and community right-to-know provisions established by Section 313 of EPCRA and Section 6607 of the Pollution Prevention Act of 1990, without restriction to the specified SIC Codes. The report format requires identification of the facility SIC Code in the TRI Report. Application of definitions and requirements provided in Title 40, Code of Federal Regulations Part 372.22 has led to the adoption of SIC Code 9999, Nonclassifiable Establishments, as the primary Hanford Site SIC Code for EPCRA regulatory assessments. The SIC Code 9999 determination is based on a broad analysis of the current mission of the Hanford Site which includes environmental and waste management, demonstration and application of advanced remediation technologies, and environmental restoration.

2989 (DOE/RL-94-39) **Strategic plan for Hanford Site Environmental Restoration Information Management.** Cowley, P.J. (and others); Beck, J.E.; Gephart, R.E. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL-9429). Order Number DE94016861. Source: OSTI; NTIS; INIS; GPO Dep.

This strategic plan addresses information management for the Environmental Restoration (ER) Program at the Hanford Site. This Program leads the cleanup of the Hanford Site's soil, groundwater, buried waste, and the decontamination and decommissioning of facilities. The vision that drives this strategic plan is to ensure that quality information is available to the people who need it, when they need it, at a convenient location, in a usable form, and at an acceptable cost. Although investments are being made in managing the vast amounts of information, which include data, records and documents associated with the Hanford Site's production history and new cleanup mission, it is widely recognized that efforts to date have not accomplished the vision. Effective information management involves more than the compilation of massive amounts of electronic and non-electronic information. It also involves integrating information management into business processes that support user's needs and decisionmaking. Only then can information management complement and enable environmental restoration priorities and practices, help identify environmental restoration requirements, and enable communication within the Environmental Restoration Program and between the Program and its stakeholders. Successfully accomplishing the Hanford Site mission requires an integrated approach to information management that crosses organizational boundaries, streamlines existing systems, and builds new systems that support the needs of the future. This plan outlines that approach.

2990 (DOE/SR/18445-T1) **Infrastructure support for the Waste Management Institute at North Carolina A&T**

State University. Progress report, September 1994–January 1995. Uzochukwu, G.A. North Carolina Agricultural and Technical State Univ., Greensboro, NC (United States). 25 Jan 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-94SR18445. Order Number DE95005776. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Waste Management Institute is two-fold: (1) to enhance awareness and understanding of waste problems and their management in our society and, (2) to provide leadership in research, instruction and outreach to improve the quality of life on a global scale and protect the environment.

2991 (EGG-M-94071) Applications for electronic documents. Beitel, G.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9406297-1: 1994 annual meeting of the American Nuclear Society (ANS), Stanford, CA (United States), 19-23 Jun 1994). Order Number DE95005036. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the application of electronic media to documents, specifically Safety Analysis Reports (SARs), prepared for Environmental Restoration and Waste Management (ER&WM) programs being conducted for the Department of Energy (DOE) at the Idaho National Engineering Laboratory (INEL). Efforts are underway to upgrade our document system using electronic format. To satisfy external requirements (DOE, State, and Federal), ER&WM programs generate a complement of internal requirements documents including a SAR and Technical Safety Requirements along with procedures and training materials. Of interest, is the volume of information and the difficulty in handling it. A recently prepared ER&WM SAR consists of 1,000 pages of text and graphics; supporting references add 10,000 pages. Other programmatic requirements documents consist of an estimated 5,000 pages plus references.

2992 (EGG-M-94180) Controlling changes - lessons learned from waste management facilities. Johnson, B.M.; Koplow, A.S.; Stoll, F.E.; Waetje, W.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9405138-3: 1994 Department of Energy configuration management workshop, Las Vegas, NV (United States), 3 May 1994). Order Number DE95005040. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses lessons learned about change control at the Waste Reduction Operations Complex (WROC) and Waste Experimental Reduction Facility (WERF) of the Idaho National Engineering Laboratory (INEL). WROC and WERF have developed and implemented change control and an as-built drawing process and have identified structures, systems, and components (SSCS) for configuration management. The operations have also formed an Independent Review Committee to minimize costs and resources associated with changing documents. WROC and WERF perform waste management activities at the INEL. WROC activities include storage, treatment, and disposal of hazardous and mixed waste. WERF provides volume reduction of solid low-level waste through compaction, incineration, and sizing operations. WROC and WERF's efforts aim to improve change control processes that have worked inefficiently in the past.

2993 (EGG-WTD-11252) Buried Waste Integrated Demonstration Commercialization Action Plans second

quarter, FY-94. Kaupanger, R.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002031. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Government is extremely good at creating knowledge and developing new technology. However, our declining market share in many industries points to a weakness in our ability to successfully commercialize new discoveries. BWID assembled a team of qualified experts with expertise in technology transfer and broad-based technology knowledge to assist with this effort. Five new technologies were chosen to develop commercialization action plans. They include Dig-Face Characterization, Imaging Infrared Interferometer for Waste Characterization, Tensor Magnetic Gradiometer, Very Early Time Electromagnetic System, and Virtual Environment Generation of Buried Waste. Each plan includes a short description of the technology, a market overview, a list of potential customers, a description of competitors and the technology's competitive advantage, the status of intellectual property, the status of technology transfer, a table of action items, commercialization contacts, and program contacts.

2994 (EGG-WTD-11252-Vol.1) Buried Waste Integrated Demonstration commercialization actions plans. Volume 1. Kaupanger, R.M. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Glore, D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002011. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) is sponsored by US Department of Energy (DOE) Office of Technology Development. BWID supports the development and demonstration of a suite of technologies that when integrated with commercially available baseline technologies form a comprehensive system for the effective and efficient remediation of buried waste throughout the DOE complex. BWID evaluates, validates, and demonstrates technologies and transfers this information throughout DOE and private industry to support DOE remediation planning and implementation activities. This report documents commercialization action plans for five technologies with near-term commercialization/implementation potential as well as provides a status of commercial and academic partners for each technology.

2995 (ES/ER/TM-56/V1) Guidelines for the creation and management of geographic data bases within a GIS environment, version 1.0. Durfee, R.C.; Land, M.L.; McCord, R.A.; Olson, R.J.; Thomas, J.K.; Tinnel, E.P.; Voorhees, L.D. Oak Ridge National Lab., TN (United States). Jul 1994. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019214. Source: OSTI; NTIS; INIS; GPO Dep.

A Geographic Information System (GIS) provides the ability to manage and analyze all types of geographic and environmental information. It performs these functions by providing the tools necessary to capture, access, analyze, and display spatially referenced information in graphic and tabular form. Typical data elements that can be visualized in a map might include roads, buildings, topography, streams, waste areas, monitoring wells, groundwater measurements, soil sample results, landcover, and demography. The intent of this document is to provide data management and quality assurance (QA) guidelines that will aid implementors and

users of GIS technology and data bases. These guidelines should be useful in all, phases of GIS activities, including the following: (1) project planning, (2) data collection and generation, (3) data maintenance and management, (4) QA and standards, (5) project implementation, (6) spatial analysis and data interpretation, (7) data transformation and exchange, and (8) output and reporting. The daily use of desktop GIS technologies within Martin Marietta Energy Systems, Inc. (Energy Systems), is a relatively new phenomenon, but usage is increasing rapidly. Large volumes of GIS-related data are now being collected and analyzed for the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) and its facilities. It is very important to establish and follow good data management practices for GIS. In the absence of such practices, data-related problems will overwhelm users for many years. In comparison with traditional data processing and software life-cycle management, there is limited information on GIS QA techniques, data standards and structures, configuration control, and documentation practices. This lack of information partially results from the newness of the technology and the complexity of spatial information and geographic analysis techniques as compared to typical tabular data management.

2996 (ES/ER/TM-56/V2) Guidelines for the creation and management of geographic data bases within a GIS environment, version 1.0: Volume II - appendices. Durfee, R.C.; Land, M.L.; McCord, R.A.; Olson, R.J.; Thomas, J.K.; Tinnel, E.P.; Voorhees, L.D. Oak Ridge National Lab., TN (United States). Jul 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019215. Source: OSTI; NTIS; GPO Dep.

This report is the documentation for the geographic data bases within the GIS environment. The data base is to be used in the Environmental Restoration projects being conducted throughout the United States.

2997 (ES/ER/TM-104) Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities. Ethier, E.L.; Houlberg, L.M.; Bock, R.E. Oak Ridge National Lab., TN (United States). Jun 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002295. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to address regulatory requirements for decontamination and decommissioning (D and D) activities at the Oak Ridge Reservation and Paducah Gaseous Diffusion Plant. This report is a summary of potential federal and state regulatory requirements applicable to general D and D activities. Excerpts are presented in the text and tables from the complete set of regulatory requirements. This report should be used as a guide to the major regulatory issues related to D and D. Compliance with other federal, state, and local regulations not addressed here may be required and should be addressed carefully by project management on a site-specific basis. The report summarizes the major acts and implementing regulations (e.g., Resource and Conservation Recovery Act, Clean Air Act, and Toxic Substances Control Act) only with regard to D and D activities. Additional regulatory drivers for D and D activities may be established through negotiated agreements, such as the Federal Facility Agreement and the US Environmental Protection Agency Mixed Waste Federal Facility Compliance

Agreement; these are discussed in this report. The DOE orders and Energy Systems procedures also are summarized briefly in instances where they directly apply to D and D.

2998 (ES/ER/TM-113) Environmental Restoration Information Resource Management Program Plan. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Sep 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004739. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Information Resources Management (ER IRM) Program Plan defines program requirements, organizational structures and responsibilities, and work breakdown structure and to establish an approved baseline against which overall progress of the program as well as the effectiveness of its management will be measured. This plan will guide ER IRM Program execution and define the program's essential elements. This plan will be routinely updated to incorporate key decisions and programmatic changes and will serve as the project baseline document. Environmental Restoration Waste Management Program intersite procedures and work instructions will be developed to facilitate the implementation of this plan.

2999 (ES/ER/TM-120/V1) Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 1, Introduction. Oak Ridge National Lab., TN (United States). Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001384. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Environmental Restoration Program at Martin Marietta, IEM (Information Engineering Methodology) was developed as part of a complete and integrated approach to the progressive development and subsequent maintenance of automated data sharing systems. This approach is centered around the organization's objectives, inherent data relationships and business practices. IEM provides the Information Systems community with a tool kit of disciplined techniques supported by automated tools. It includes seven stages: Information Strategy Planning; Business Area Analysis; Business System Design; Technical Design; Construction; Transition; Production.

3000 (ES/ER/TM-120/V2) Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 2, Interim business systems guidance. Oak Ridge National Lab., TN (United States). Sep 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001385. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Environmental Restoration Program at Martin Marietta, IEM (Information Engineering Methodology) was developed as part of a complete and integrated approach to the progressive development and subsequent maintenance of automated data sharing systems. This approach is centered around the organization's objectives, inherent data relationships, and business practices. IEM provides the Information Systems community with a tool kit of disciplined techniques supported by automated tools. It includes seven stages: Information Strategy Planning; Business Area Analysis; Business System Design; Technical Design; Construction; Transition; Production. This document focuses on the Business Systems Architecture.

3001 (ES/ER/TM-120/V3) Information management architecture for an integrated computing environment

for the Environmental Restoration Program. **Environmental Restoration Program, Volume 3, Interim technical architecture.** Oak Ridge National Lab., TN (United States). Sep 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001386. Source: OSTI; NTIS; INIS; GPO Dep.

This third volume of the Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program—the Interim Technical Architecture (TA) (referred to throughout the remainder of this document as the ER TA)—represents a key milestone in establishing a coordinated information management environment in which information initiatives can be pursued with the confidence that redundancy and inconsistencies will be held to a minimum. This architecture is intended to be used as a reference by anyone whose responsibilities include the acquisition or development of information technology for use by the ER Program. The interim ER TA provides technical guidance at three levels. At the highest level, the technical architecture provides an overall computing philosophy or direction. At this level, the guidance does not address specific technologies or products but addresses more general concepts, such as the use of open systems, modular architectures, graphical user interfaces, and architecture-based development. At the next level, the technical architecture provides specific information technology recommendations regarding a wide variety of specific technologies. These technologies include computing hardware, operating systems, communications software, database management software, application development software, and personal productivity software, among others. These recommendations range from the adoption of specific industry or Martin Marietta Energy Systems, Inc. (Energy Systems) standards to the specification of individual products. At the third level, the architecture provides guidance regarding implementation strategies for the recommended technologies that can be applied to individual projects and to the ER Program as a whole.

3002 (ES/ESH-50) Portsmouth Gaseous Diffusion Plant annual site environmental report for 1993. Horak, C.M. (ed.). Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Inc., Piketon, OH (United States). Nov 1994. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (POEF-3050). Order Number DE95006673. Source: OSTI; NTIS; INIS; GPO Dep.

This calendar year (CY) 1993 annual report on environmental monitoring of the US Department of Energy's (DOE's) Portsmouth Gaseous Diffusion Plant (Portsmouth) and its environs consists of three separate documents: a summary pamphlet for the general public; a more detail discussion and of compliance status, data, and environmental impacts (this document); and a volume of detailed data that is available on request. The objectives of this report are to report compliance status during 1993; provide information about the plant site and plant operations; report 1993 monitoring data for the installation and its environs that may have been affected by operations on the plant site; document information on input and assumptions used in calculations; provide trend analyses (where appropriate) to indicate increases and decreases in environmental impact, and provide general information on quality assurance for the environmental monitoring program.

3003 (ES/ESH-51) Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report summary for 1993. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Portsmouth Gaseous Diffusion Plant, OH (United States). Nov 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (POEF-3051). Order Number DE95006672. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains summaries of the environmental programs at Paducah Gaseous Diffusion Plant, environmental monitoring and the results, and the impact of operations on the environment and the public for 1993. The environmental monitoring program at Paducah includes effluent monitoring and environmental surveillance. Effluent monitoring is measurement of releases as they occur. Contaminants are released through either airborne emissions or liquids discharged from the plant. These releases occur as part of normal site operations, such as cooling water discharged from the uranium enrichment cascade operations or airborne releases from ventilation systems. In the event of system failure, this monitoring provides timely warning so that corrective action can be taken before releases reach an unsafe level. Environmental surveillance tracks the dispersion of materials into the environment after they have been released. This involves the collection of samples from various media, such as water, soil, vegetation, and food crops, and the analysis of these samples for certain radionuclides, chemicals, and metals.

3004 (ES/ESH-53) Paducah Gaseous Diffusion Plant Annual Site Environmental Report for 1993. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Paducah, KY (United States). Oct 1994. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (KY/ERWM-18). Order Number DE95006635. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to summarize effluent monitoring and environmental surveillance results and compliance with environmental laws, regulations, and orders at the Paducah Gaseous Diffusion Plant (PGDP). Environmental monitoring at PGDP consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is direct measurement or the collection and analysis of samples of liquid and gaseous discharges to the environment. Environmental surveillance is direct measurement or the collection and analysis of samples of air, water, soil, foodstuff, biota, and other media. Environmental monitoring is performed to characterize and quantify contaminants, assess radiation exposures of members of the public, demonstrate compliance with applicable standards and permit requirements, and detect and assess the effects (if any) on the local environment. Multiple samples are collected throughout the year and are analyzed for radioactivity, chemical content, and various physical attributes.

3005 (ES/ESH-54) Paducah Gaseous Diffusion Plant Annual Site Environmental Report summary for 1993. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Paducah, KY (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (KY/ERWM-19). Order Number DE95006671. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains summaries of the environmental programs at Paducah Gaseous Diffusion Plant, environmental monitoring and the results, and the impact of operations on

the environment and the public for 1993. The environmental monitoring program at Paducah includes effluent monitoring and environmental surveillance. Effluent monitoring is measurement of releases as they occur. Contaminants are released through either airborne emissions or liquids discharged from the plant. These releases occur as part of normal site operations, such as cooling water discharged from the uranium enrichment cascade operations or airborne releases from ventilation systems. In the event of system failure, this monitoring provides timely warning so that corrective action can be taken before releases reach an unsafe level. Environmental surveillance tracks the dispersion of materials into the environment after they have been released. This involves the collection of samples from various media, such as water, soil, vegetation, and food crops, and the analysis of these samples for certain radionuclides, chemicals, and metals.

3006 (ESTSC-000675IBMMF00) BSP. Budgets Summary Process. Johnson, D. (EG and G Idaho, Inc., Idaho Falls, ID (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States). 1 Jan 1987. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Source: ESTSC.

Description: IBM MAINFRAMES; On IBM 3090 VM/ESA, is capable oREXX (5%) NOMAD (95%); 1 Mag Tape. The VM operating system this process currently runs under has some naming conventions. FileName FileType FileMode are the three qualifiers. REXX requires that the FileType must be EXEC. NOMAD requires that the FileType must be NOMAD. The FileName is freeform; for this program, the name BUDGETS was chosen as the FileName for both the REXX and the NOMAD code. The FileMode refers to the disk - in VM this is usually the A disk.

The purpose of the BSP program is to provide an automated means of tracking budgets vs actual costs incurred for the CPRIMS (Construction Project Reporting Information Management System) project. The programs prompt for minimal information and then provides all of the desired calculations for the data base and report. Prior to this program, this was a manual process, tracking the weekly costs for the CPRIMS project. This generic process could be used for any project, not just the CPRIMS project.

3007 (FEMP-2353) Standards/requirements identification documents (S/RIDS). Beckman, W.H.; Alhadeff, N. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-9409200-1: Border environmental technology conference, Buffalo, NY (United States), 19-21 Sep 1994). Order Number DE94018444. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the Fernald Environmental Restoration Management Corporation's (FERMCO) Standards/Requirement Identification Documents (S/RIDS) Development Program, the unique process used to implement it, and the status of the program. We will also discuss the lessons learned as the development program was implemented. The Department of Energy (DOE) established the Fernald site to produce uranium metals for the nation's defense programs in 1953. In 1989, DOE suspended production and, in 1991, the mission of the site was formally changed to one of environmental cleanup and restoration. The site was renamed the Fernald Environmental Management Project (FEMP) to reflect this change. From its

inception until November 1992, the site was managed under a Management and Operating contract. As a result in the change in mission, DOE awarded an Environmental Restoration Management Contract (ERMC), focusing on restoration. FERMCO assumed management of the site December 1, 1992. The joint DOE/FERMCO mission is to protect human health and the environment through the safe, early, and least-cost final clean-up of the site in compliance with all applicable regulations and commitments while addressing stakeholder concerns. DOE has managed nuclear facilities primarily through its oversight of Management and Operating contractors. These contractors were responsible for formulating, selecting, and administering standards controlling design, construction, operations, and maintenance. The DOE Operations Office Manager was responsible for approving individual contractor practices and the governing site standards and requirements to be met. Due to the absence of comprehensive nuclear industry standards when most DOE sites were first established, Management and Operating contractors had to apply existing non-nuclear industry standards and, in many cases, formulate new technical standards to address unique applications.

3008 (FEMP-2394) Implementing the theories: A fully integrated project control system that's implemented and works. Harris, R.E. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 8 Dec 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-941246-3: 2. annual EM cost management conference, San Francisco, CA (United States), 5-9 Dec 1994). Order Number DE95004943. Source: OSTI; NTIS; INIS; GPO Dep.

Using the theories presented in DOE Orders 4700.1, 1332.1A, and Notice 4700.5 as the basis for system design, the Fernald Environmental Restoration Management Corporation (FERMCO) has developed and implemented a Project Control System (PCS) that complies with requirements and provides DOE and FERMCO management with timely performance measurement information. To this extent, the FERMCO PCS probably is similar to the systems of the majority of the contractors in the DOE complex. In fact, this facet of the FERMCO PCS generally mirrors those used on projects around the world by FERMCO's parent company, Fluor Daniel. Starting with this "platform", the vision and challenge of creating a fully integrated system commenced. An open-architecture systems approach is the factor that most greatly influenced and enabled the successful development and implementation of the Project Control System for the Fernald Environmental Management Project. All aspects of a fully integrated system were considered during the design phase. The architecture of the FERMCO system enables seamless, near real-time, transfer of data both from and to the Project Control System with all other related systems. The primary systems that provide and share data with the Project Control System include those used by the Payroll, Accounting, Procurement, and Human Resources organizations. To enable data linking with these organizations, the resource codes were designed to map many-to-one from their detailed codes to the summarized codes used in the PCS.

3009 (FEMP-2396) Integrated planning: A baseline development perspective. Clauss, L.; Chang, D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 9 Dec 1994. 9p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-941246-6: 2. annual EM cost management conference, San Francisco, CA (United States), 5-9 Dec 1994). Order Number DE95004945. Source: OSTI; NTIS; INIS; GPO Dep.

The FEMP Baseline establishes the basis for integrating environmental activity technical requirements with their cost and schedule elements. The result is a path forward to successfully achieving the FERMCO mission. Specific to cost management, the FEMP Baseline has been incorporated into the FERMCO Project Control System (PCS) to provide a time-phased budget plan against which contractor performance is measured with an earned value management system. The result is the Performance Measurement Baseline (PMB), an important tool for keeping cost under control.

3010 (ICF-0001) Landlord Program multi-year program plan fiscal year 1995 WBS 7.5. Young, C.L. ICF Kaiser Hanford Co., Richland, WA (United States). 26 Sep 1994. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12359. Order Number DE95001294. Source: OSTI; NTIS; INIS; GPO Dep.

The Landlord Program mission is to maintain, preserve, or upgrade the strategic assets of the Hanford Site to meet the overall cleanup mission. This encompasses innovative, appropriate, and cost effective general purpose infrastructure support, services, and long range strategic site planning that is the foundation for seven major Hanford programs. These programs are (1) Environmental Restoration, (2) Tank Waste Remediation System, (3) Solid/Liquid Waste Decontamination, (4) Facility Transition, (5) Spent Fuel, (6) Technology Development, and (7) the Multi-Program Laboratory. General infrastructure support consists of facilities, systems, and equipment that by design or use are not essentially dedicated to a single program mission. Facilities include laboratories, shops, warehouses, and general work space. Systems include electrical, process sewers, rail, roads, telecommunications, water, fire and emergency response, and steam supply and distribution. Funding also supports capital equipment critical to maintaining, upgrading, or operating the general infrastructure. Paramount to these objectives is compliance with all applicable laws, orders, agreements, codes, standards, best management and safety practices. The objectives for general infrastructure support are reflected in five programmatic functions, (1) Program Integration, (2) Capital Equipment, (3) Expense Funded Projects, (4) General Plant Projects, and (5) Line Items.

3011 (INEL-94/0205) Avoidable waste management costs. Hsu, K.; Burns, M.; Priebe, S.; Robinson, P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 253p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008669. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the activity based costing method used to acquire variable (volume dependent or avoidable) waste management cost data for routine operations at Department of Energy (DOE) facilities. Waste volumes from environmental restoration, facility stabilization activities, and legacy waste were specifically excluded from this effort. A core team consisting of Idaho National Engineering Laboratory, Los Alamos National Laboratory, Rocky Flats Environmental Technology Site, and Oak Ridge Reservation developed and piloted the methodology, which can be used to determine avoidable waste management costs. The method developed to gather information was based on

activity based costing, which is a common industrial engineering technique. Sites submitted separate flow diagrams that showed the progression of work from activity to activity for each waste type or treatability group. Each activity on a flow diagram was described in a narrative, which detailed the scope of the activity. Labor and material costs based on a unit quantity of waste being processed were then summed to generate a total cost for that flow diagram. Cross-complex values were calculated by determining a weighted average for each waste type or treatability group based on the volume generated. This study will provide DOE and contractors with a better understanding of waste management processes and their associated costs. Other potential benefits include providing cost data for sites to perform consistent cost/benefit analysis of waste minimization and pollution prevention (WMIN/PP) options identified during pollution prevention opportunity assessments and providing a means for prioritizing and allocating limited resources for WMIN/PP.

3012 (LA-SUB-94-17) Support to LANL: Cost estimation: Final report. Los Alamos National Lab., NM (United States); ICF Kaiser Engineers, Inc., Fairfax, VA (United States). 4 Oct 1993. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94015420. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the activities and progress by ICF Kaiser Engineers conducted on behalf of Los Alamos National Laboratories (LANL) for the US Department of Energy, Office of Waste Management (EM-33) in the area of improving methods for Cost Estimation. This work was conducted between October 1, 1992 and September 30, 1993. ICF Kaiser Engineers supported LANL in providing the Office of Waste Management with planning and document preparation services for a Cost and Schedule Estimating Guide (Guide). The intent of the Guide was to use Activity-Based Cost (ABC) estimation as a basic method in preparing cost estimates for DOE planning and budgeting documents, including Activity Data Sheets (ADSs), which form the basis for the Five Year Plan document. Prior to the initiation of the present contract with LANL, ICF Kaiser Engineers was tasked to initiate planning efforts directed toward a Guide. This work, accomplished from June to September, 1992, included visits to eight DOE field offices and consultation with DOE Headquarters staff to determine the need for a Guide, the desired contents of a Guide, and the types of ABC estimation methods and documentation requirements that would be compatible with current or potential practices and expertise in existence at DOE field offices and their contractors.

3013 (LA-UR-94-2694) Implementation of electronic chain-of-custody, analysis requests, and data verification at Los Alamos National Laboratory. Pound, H.C.; Miglio, J.J. Los Alamos National Lab., NM (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940985-7: American Society for Quality Control Energy and Environmental Quality Division conference, Tucson, AZ (United States), 18-21 Sep 1994). Order Number DE94018076. Source: OSTI; NTIS; GPO Dep.

To improve the efficiency of the entire environmental data collection process from sample collection to reporting to the client, Los Alamos National Laboratory is developing an automated system to carry out as much of the process as possible. The system uses "off-the-shelf" software. Our program anticipates a drastic reduction of the amount of paper generated throughout the process. The electronic system

includes spreadsheets used for field and laboratory chains-of-custody. In addition, the system is used to order analyses and to verify data for compliance.

3014 (LA-UR-94-3825) Independent Technical ("Red Team") Reviews. Thullen, P. (Los Alamos National Labs., NM (United States)); Bennett, D.R.; Kosiewicz, S.T.; Weaver, D.L. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102-35: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95003690. Source: OSTI; NTIS; INIS; GPO Dep.

Offices under the Assistant Secretary for Environmental Restoration and Waste Management (EM) in the Department of Energy (DOE) and some National Laboratories are using Independent Technical or "Red Team" Reviews to understand and improve the performance of major projects, major system acquisitions, programs and organizations. A core group formed in 1991 by Los Alamos National Laboratory and Sandia National Laboratories, has organized teams of commercial and private consultants to perform over fifteen Independent Technical Reviews (ITRs) throughout the DOE Complex. This paper discusses: review initiation, team formation, methodology, site response, and observations gathered over the past three years.

3015 (LA-UR-95-198) Two perspectives on a successful lab/industry technology transfer. MacArthur, D.W. (Los Alamos National Lab., NM (United States)); Ulbrich, R. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216-74: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006326. Source: OSTI; NTIS; INIS; GPO Dep.

Technology transfer from government laboratories to private business is of increasing concern in today's marketplace. Some prospective partners (on both sides) believe that technology transfer is a relatively simple process requiring little or no extra effort from the participants. In the authors experience this is not true and, in fact, positive results from a collaboration are directly proportional to the effort that both parties invest in the relationship. Communication, both between prospective partners before an agreement and between partners following the agreement, is essential. Neither technology nor marketing can stand by itself; it is the combination of the two that can produce a useful and available product. Laboratories and industries often have very different ways of looking at almost everything. Misunderstandings arising from these differences can short-circuit the transfer process or result in the production of a product that is unsalable. The authors will cover some of their experiences, potential problems, and their solutions. Examples discussed here is transfer of technology for long-range alpha detection developed at Los Alamos National Laboratory and transferred to Eberline Instrument Corporation.

3016 (LA-UR-95-212) Citizen advisory boards: An empirical model for choosing goals and methods. Kunsberg, P. Los Alamos National Lab., NM (United States). Dec 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006292. Source: OSTI; NTIS; INIS; GPO Dep.

This is a study of Citizen Advisory Boards (CABS) undertaken for the Department of Energy (DOE) to draw practical insights from the accumulated experience of CAB members

and agency officials who have worked with these boards over many years. Hence the main research tool is in-depth interviews of these individuals. In addition, the study relies on field observations of CABs at work, historical documentation of individual boards, and a large body of academic, professional, and government literature. The DOE is in the process of establishing Site Specific Advisory Boards (SSABs) at most of its major facilities in order to provide for community involvement in the DOE environmental restoration and environmental management programs, but these boards initiated by DOE do not yet have enough of a track-record for a study of this type. Consequently, the study focused on CABs at six other federal agencies which have had substantial experience with boards that are similar in composition and purpose to the SSABs. The study examined common problem that confront virtually every CAB in its organization and its decision-making process. For example, each board faces difficult issues in defining its goals and representational responsibilities, selection of members, selection of issues, reaching agreement on recommendations to the parent agency, getting responsive action from the parent agency, and evaluating the board's success over time. An effort was made to identify solutions or best approaches to these fundamental problems such that the recommended approach has broad application to citizen advisory boards concerned with environmental issues. The conclusions of the study are summarized in a model which incorporates the optimal approaches discovered with respect to each of the critical issues. While acknowledging that the particular circumstances of a CAB may call for individual variations, the model provides a fairly comprehensive description of recommended features of a CAB.

3017 (LBL-34468) Development of analytical and numerical models for the assessment and interpretation of hydrogeological field tests. Mironenko, V.A. (St. Petersburg Mining Inst. (Russian Federation)); Rumynin, V.G.; Konosavsky, P.K.; Pozdniakov, S.P.; Shestakov, V.M.; Roshal, A.A. Lawrence Berkeley Lab., CA (United States). Jul 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95006725. Source: OSTI; NTIS; INIS; GPO Dep.

Mathematical models of the flow and tracer tests in fractured aquifers are being developed for the further study of radioactive wastes migration in round water at the Lake Area, which is associated with one of the waste disposal site in Russia. The choice of testing methods, tracer types (chemical or thermal) and the appropriate models are determined by the nature of the ongoing ground-water pollution processes and the hydrogeological features of the site under consideration. Special importance is attached to the increased density of wastes as well as to the possible redistribution of solutes both in the liquid phase and in the absorbed state (largely, on fracture surfaces). This allows for studying physical-and-chemical (hydrogeochemical) interaction parameters which are hard to obtain (considering a fractured structure of the rock mass) in laboratory. Moreover, a theoretical substantiation is being given to the field methods of studying the properties of a fractured stratum aimed at the further construction of the drainage system or the sub-surface flow barrier (cutoff wall), as well as the monitoring system that will evaluate the reliability of these ground-water protection measures. The proposed mathematical models are based on a tight combination of analytical and numerical methods, the former being preferred in solving the principal (2D axisymmetrical) class of the problems. The choice of

appropriate problems is based on the close feedback with subsequent field tests in the Lake Area. 63 refs.

3018 (LBL-36211) Development of hydrogeological modelling approaches for assessment of consequences of hazardous accidents at nuclear power plants. Rumynin, V.G. (St. Petersburg Mining Inst. (Russian Federation)); Mironenko, V.A.; Konosavsky, P.K.; Pereverzeva, S.A. Lawrence Berkeley Lab., CA (United States). Jul 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95006719. Source: OSTI; NTIS; INIS; GPO Dep.

This paper introduces some modeling approaches for predicting the influence of hazardous accidents at nuclear reactors on groundwater quality. Possible pathways for radioactive releases from nuclear power plants were considered to conceptualize boundary conditions for solving the subsurface radionuclides transport problems. Some approaches to incorporate physical-and-chemical interactions into transport simulators have been developed. The hydrogeological forecasts were based on numerical and semi-analytical scale-dependent models. They have been applied to assess the possible impact of the nuclear power plants designed in Russia on groundwater reservoirs.

3019 (LBL-36212) The cascade of reservoirs of the "Mayak" Plant: Case history and the first version of a computer simulator. Mironenko, M.V. (Russian Academy of Sciences, Moscow (Russian Federation). Vernadsky Inst. of Geochemistry and Analytical Chemistry); Spasennykh, M.Yu.; Polyakov, V.B. Lawrence Berkeley Lab., CA (United States). Jul 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95006727. Source: OSTI; NTIS; INIS; GPO Dep.

The improvement of the ecological conditions at waste storing reservoirs is an important task of the restoration activity at Production Association (PA) "Mayak" (South Urals). The radionuclides mostly ^{90}Sr , ^{137}Cs , and chemical pollutants deposited in the reservoir water and in the bottom sediment are very dangerous sources for the contamination of Techa River below the reservoirs and the contamination of groundwater in the surrounding formations. The spreading of radioactive contaminants has both hydrogeological and the chemical features. The thermodynamic approach used to account for physical-chemical interactions between water and the bed rocks based on Gibbs free energy minimization of multicomponent system (H-O-Ca-Mg-K-Na-S-Cl-C-Sr) permitted the authors to calculate the corresponding ionic and complex species existing in the solutions, and to characterize the processes of precipitation and dissolution. The model takes into account the input and output surface and underground water fluxes, mass exchange of the reservoir with the atmosphere, radioactive decay and water-sediment interaction including processes of the ^{90}Sr and ^{137}Cs sorption on the grains of the sediment and the radionuclide diffusion in the pore water. This model was used in the retrospective and prognosis calculations of radiation and hydrochemical regime of these reservoirs.

3020 (LBL-36385) Computer simulation of radionuclide transport through thermal convection of groundwater from borehole repositories. Malkovsky, V.I. (Russian Academy of Sciences, Moscow (Russian Federation). Inst. of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry); Pek, A.A. Lawrence Berkeley Lab., CA (United States). Sep 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC03-76SF00098. Order Number DE95006722. Source: OSTI; NTIS; INIS; GPO Dep.

Results are presented of numerical modeling of radionuclide transport by thermal convection of groundwater from a single well repository of high level waste. Because the problem possesses cylindrical symmetry, the process is described by a system of 2-D transient equations for momentum, convective heat transfer and convective mass transfer (taking into account hydrodynamic dispersion and radionuclide decay). Results of computer simulations for a selected range of system parameters were generalized by approximating analytical relationship, which can be used for safety assessment of a radioactive waste repository. The problem of the reciprocal relationship between thermoconvective transport processes and well spacing in an underground repository with a regularly spaced set of the waste-loaded wells is examined using a two-well model as an example. In this case, the transport problem becomes three-dimensional. A solution to this problem was obtained using a special system of orthogonal coordinates, which simplifies the computational algorithm and enhances accuracy. It is shown that thermoconvective transport of radionuclides in the vicinity of each well can be considered to be independent at well separations of the order of 100 m when reasonable values of other repository parameters are assumed.

3021 (LBL-36779) Tracer transport modeling of the doublet well system. Pozdniakov, S.P. (Moscow State Univ., Moscow (Russian Federation). Dept. of Geographical); Tsang, Chin-Fu. Lawrence Berkeley Lab., CA (United States). Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95009376. Source: OSTI; NTIS; INIS; GPO Dep.

Steady-state flow and tracer transport between an injection well and a pumping well in a heterogeneous confined aquifer were investigated with numerical modeling. Calculation of transport was based on the advective model for heterogeneous aquifers. Dispersion was assumed to be controlled by microscale velocity variation. An effective parameter of dispersion evaluated on the breakthrough curves was defined to account for the influences of heterogeneity. Breakthrough curves were calculated by using numerical modeling of transport in a strongly heterogeneous aquifer with spatial heterogeneous transmissivity fields. The results of modeling were processed by comparison with analytical solutions of doublet systems to obtain the effective parameters. A special solution was developed for advective transport in aquifers with a layered structure. Examples of real field heterogeneity were given to show its influence on breakthrough curves and the resulting impact on the effective macroscopic parameters.

3022 (LBL-36780) Distribution and geochemistry of contaminated subsurface waters in fissured volcanogenic bed rocks of the Lake Karachai Area, Chelyabinsk, Southern Urals. Solodov, I.N. (Russian Academy of Sciences, Moscow (Russian Federation)); Belichkin, V.I.; Zotov, A.V.; Kochkin, B.T.; Drozhko, E.G.; Glagolev, A.V.; Skokov, A.N. Lawrence Berkeley Lab., CA (United States). Jun 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95009377. Source: OSTI; NTIS; INIS; GPO Dep.

The present investigation is devoted to the study of the distribution and geochemistry of contaminated subsurface

waters, beneath the site of temporary storage of liquid radioactive waste known as Lake Karachai. For this purpose a method of hydrogeochemical logging (HGCL) together with standard hydrogeochemical and geophysical methods of uncased hole logging were used. The distribution of sodium nitrate brine plumes in the subsurface was determined by the physical and physico-chemical properties of these brines and by the petrochemical composition of enclosing rocks and the structural setting of the flow paths. The latter is represented by fractures and large faults in the bedrock of volcanogenic and volcanogenic-sedimentary rocks of intermediate-to-basic composition. The volcanogenic rocks are overlain in some places by a thin cover of unconsolidated sediments, i.e., by loams and relatively impermeable silts. Contaminated waters flow in accordance with the eluvium bottom relief towards local areas of natural (Mishelyak and Techa rivers) and artificial (Novogomenskii water intake) discharge of subsurface waters. The large Mishelyak fault, southwest of Lake Karachai and under fluvial sediments of the Mishelyak, is assumed to significantly influence the flow pattern of contaminated waters, diverting them from an intake of drinking water.

3023 (ORNL/M-4156) The Environmental Management Project Manager's Handbook for improved project definition. Oak Ridge National Lab., TN (United States). Feb 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009041. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (DOE) is committed to providing high quality products that satisfy customer needs and are the associated with this goal, DOE personnel must possess the knowledge, skills, and abilities to ensure successful job performance. In addition, there must be recognition that the greatest obstacle to proper project performance is inadequate project definition. Without strong project definition, DOE environmental management efforts are vulnerable to fragmented solutions, duplication of effort, and wastes resources. The primary means of ensuring environmental management projects meet cost and schedule milestones is through a structured and graded approach to project definition, which is the focus of this handbook.

3024 (ORNL/TM-12724) Quality assurance plan for Final Waste Forms project in support of the development, demonstration, testing and evaluation efforts associated with the Oak Ridge reservation's LDR/FFCA compliance. Gilliam, T.M.; Matus, C.H. Oak Ridge National Lab., TN (United States). Jul 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94017591. Source: OSTI; NTIS; INIS; GPO Dep.

This quality assurance project plan specifies the data quality objectives for Phase I of the Final Waste Forms Project and defines specific measurements and processes required to achieve those objectives. Although the project is funded by the U.S. Department of Energy (DOE), the ultimate recipient of the results is the U.S. Environmental Protection Agency (EPA). Consequently, relevant quality assurance requirements from both organizations must be met. DOE emphasizes administrative structure to ensure quality; EPA's primary focus is the reproducibility of the generated data. The ten criteria of DOE Order 5700.6C are addressed in sections of this report, while the format used is that prescribed by EPA for quality assurance project plans.

3025 (ORNL/TM-12774) ELIPGRID-PC: A PC program for calculating hot spot probabilities. Davidson, J.R. Oak Ridge National Lab., TN (United States). Oct 1994. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002507. Source: OSTI; NTIS; INIS; GPO Dep.

ELIPGRID-PC, a new personal computer program has been developed to provide easy access to Singer's 1972 ELIPGRID algorithm for hot-spot detection probabilities. Three features of the program are the ability to determine: (1) the grid size required for specified conditions, (2) the smallest hot spot that can be sampled with a given probability, and (3) the approximate grid size resulting from specified conditions and sampling cost. ELIPGRID-PC also provides probability of hit versus cost data for graphing with spreadsheets or graphics software. The program has been successfully tested using Singer's published ELIPGRID results. An apparent error in the original ELIPGRID code has been uncovered and an appropriate modification incorporated into the new program.

3026 (ORNL/TM-12817, pp. 409) Automated radioactive control system of the Moscow Meson Factory's releases. Serezhnikov, S.V. (Institute for Nuclear Research of the Russian Academy of Sciences, Moscow (Russian Federation)); Stepanov, V.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171-: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts*. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

We have been investigating the radiation environmental effects from high current proton accelerators. Now we are creating an Automatic Radioactive Control System of the Moscow meson factory's releases (ARCS) into the atmosphere. The composition of the releases consists primarily of the short-lived radioactive gases C, N, O, O. About 10% of the releases consist of Ar and about 2% are other radionuclides. The continual sampling of the released mixture results from the pressure difference existing in the ventilation system. The mixture sampling network includes the filters, the ionization and the measuring chambers, where gamma-rays with energy of 0.511 Mev and 1.29 Mev are measured with the scintillation gamma spectrometer. Additionally, the system measures gross gamma and beta activity, the speed of the selected mixture, the speed of the released mixture, the speed and direction of the wind, the vertical gradient of the temperature and the humidity of the released mixture. The results of the measurements needed for sight and population dose model calculations are written into a database of ARCS.

3027 (PNL-9450-1) International Nuclear Waste Management Fact Book. Leigh, I.W. Pacific Northwest Lab., Richland, WA (United States). May 1994. 338p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018005. Source: OSTI; NTIS; INIS; GPO Dep.

International Nuclear Waste Management Fact Book has been compiled in an effort to provide current data concerning fuel cycle and waste management facilities, R&D programs, and key personnel in 24 countries, including the US, four multinational agencies and 21 nuclear societies. This publication succeeds the previously issued International Nuclear Fuel Cycle Fact Book (PNL-3594), which

appeared annually for 13 years. While the title is different, there are no substantial changes in the content.

3028 (PNL-9823) Hanford Site Environmental Report 1993. Dirkes, R.L.; Hanf, R.W.; Woodruff, R.K. (eds.). Battelle Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 357p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000320. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Environmental Report is prepared annually to summarize environmental data and information, describe environmental management performance, and demonstrate the status of compliance with environmental regulations. The report also highlights major environmental programs and efforts. The report is written to meet reporting requirements and Guidelines of the U.S. Department of Energy (DOE) and to meet the needs of the public. This summary has been written with a minimum of technical terminology. Individual sections of the report are designed to (a) describe the Hanford Site and its mission, (b) summarize the status in 1993 of compliance with environmental regulations, (c) describe the environmental programs at the Hanford Site, (d) discuss estimated radionuclide exposure to the public from 1993 Hanford activities, (e) present information on effluent monitoring and environmental surveillance, including ground-water protection and monitoring, (f) discuss activities to ensure quality. More detailed information can be found in the body of the report, the appendixes, and the cited references.

3029 (PNL-9824) Hanford Site environmental data for calendar year 1993—surface and Columbia River. Bisping, L.E. Battelle Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 322p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000319. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental monitoring at the Hanford Site, located in southeastern Washington State, is conducted by Battelle Memorial Institute, Pacific Northwest Division, as part of its contract to operate the Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy. The data collected provide a historical record of radionuclide and radiation levels attributable to natural causes, worldwide fallout, and Hanford operations. Data are also collected to monitor several chemicals. Pacific Northwest Laboratory publishes an annual environmental report for the Hanford Site each calendar year. The Hanford Site Environmental Report for Calendar Year 1993 describes the Site mission and activities, general environmental features, radiological and chemical releases from operations, status of compliance with environmental regulations, status of programs to accomplish compliance, and environmental monitoring activities and results. The report includes a summary of offsite and onsite environmental monitoring data collected during 1993 by PNL's Environmental Monitoring Program. Appendix A of that report contains data summaries created from raw surface and river monitoring data. This volume contains the actual raw data used to create the summaries.

3030 (PNL-10062) Hanford Mission Plan risk-based prioritization methodologies. Hesser, W.A. (Pacific Northwest Lab., Richland, WA (United States)); Madden, M.S.; Pylon, N.M.; Butcher, J.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 41p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018618. Source: OSTI; NTIS; INIS; GPO Dep.

Sites across the US Department (DOE) complex recognize the critical need for a systematic method for prioritizing among their work scope activities. Here at the Hanford Site, Pacific Northwest Laboratory and Westinghouse Hanford Company (WHC) conducted preliminary research into techniques to meet this need and assist managers in making financial resource allocation decisions. This research is a subtask of the risk management task of the Hanford Mission Plan as described in the WHC Integrated Planning Work Breakdown Structure 1.8.2 Fiscal Year 1994 Work Plan. The research team investigated prioritization techniques used at other DOE sites and compared them with the Priority Planning Grid (PPG), a tool used at Hanford. The authors concluded that the PPG could be used for prioritization of resource allocation, but it needed to be revised to better reflect the Site's priorities and objectives. The revised PPG was tested with three Hanford programs, the PPG was modified, and updated procedures were prepared.

3031 (PNL-10204) A proposed framework for conducting pollution prevention design assessments (P2DAs) on U.S. Department of Energy design projects. Dorsey, J.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011334. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this manual is to provide a framework for project managers, engineers, and designers to integrate pollution prevention principles and features into DOE design projects. The framework suggested is referred to as the pollution prevention design assessment (P2DA). The P2DA is based on DOE's method for conducting pollution prevention opportunity assessments (PPOAs) on existing waste-generating operations, but the P2DA is modified because the facility or process it assesses does not physically exist during design. Before the P2DA framework is introduced in the manual, recommendations for establishing the P2DA team and budget are provided. Specific pollution prevention requirements and opportunities for each design stage as delineated in DOE Order 4700.1 Project Management System are also discussed and a sample format for drafting a P2DA report is provided in the appendix. The scope of this manual includes not only the P2DA framework, but also a background discussion of pollution prevention and related topics; the regulatory requirements mandating design for pollution prevention; the benefits and barriers of designing for pollution prevention; and the impact that pollution prevention and related environmental avoidance concepts have had on the engineering profession.

3032 (PNL-10459) List of currently classified documents relative to Hanford Operations and of potential use in the Columbia River Comprehensive Impact Assessment, January 1, 1973–June 20, 1994. Miley, T.B.; Huesties, L.R. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008085. Source: OSTI; NTIS; GPO Dep.

The Columbia River Comprehensive Impact Assessment (CRCIA) Project seeks to estimate the current risk from the Columbia River resulting from past and present Hanford activities. To resolve the question of the current risk, it is necessary for the CRCIA Project to have access to any classified information that may be relevant to this study. The

purpose of this report is to present the results of the search for relevant classified information. There are two classified matter control centers operated by two prime contractors at the Hanford Site. One is operated by Pacific Northwest Laboratory (PNL) and the other is operated by Westinghouse Hanford Company (WHC). Only the WHC collection contained information relevant to a study of the Columbia River in the time frame of interest: January 1, 1973 through June 20, 1994. A list of the classified documents in the WHC collection is maintained in the WHC Classified Document Control database. The WHC Classified Document Control database was searched. The search criteria were the dates of interest and the basic keywords used for the CRCIA Project's data compendium (Eslinger et al. 1994). All Hanford-generated, Hanford-related entries that were applicable to the CRCIA Project and the dates of interest were provided. The resulting list of 477 titles comprises the Appendix of this report. The information given for each title is exactly as it appears in the database. Any inconsistencies are the result of duplicating the database.

3033 (PNL-SA-20950) A review of occupational safety and health issues relevant to the Environmental Restoration Program: Selected case histories and associated issues. Lesperance, A.M.; Siegel, M.R.; McKinney, M.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-109: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005402. Source: OSTI; NTIS; INIS; GPO Dep.

Since the 1940s, US Department of Energy (DOE) sites have been used for nuclear materials processing and production, warhead testing, and weapons research and development. These activities have resulted in extensive environmental contamination. DOE has established a goal to cleanup and restore the groundwater, soils, sediments, and surface water at its facilities across the nation. To achieve this goal, many workers will be needed to conduct the cleanup. These workers will need training and will be required to follow occupational safety and health (OSH) regulations and guidelines. Compliance with the OSH regulations and guidelines will have an anomalous influence on the schedule, money, and technology needed for environmental restoration. Therefore, one area that must be considered in the early stages of long-term planning is the impact of OSH issues on the environmental restoration process. The DOE Office of Environmental Restoration and Waste Management has requested that the Pacific Northwest Laboratory (PNL) investigate the impact of these issues on the environmental restoration process.

3034 (PNL-SA-23597) Public involvement in environmental surveillance at Hanford. Hanf, R.W. Jr.; Patton, G.W.; Woodruff, R.K.; Poston, T.M. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-94: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94018719. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental surveillance at the Hanford Site began during the mid-1940s following the construction and start-up of the nation's first plutonium production reactor. Over the past approximately 45 years, surveillance operations on and off the Site have continued, with virtually all sampling being

conducted by Hanford Site workers. Recently, the US Department of Energy Richland Operations Office directed that public involvement in Hanford environmental surveillance operations be initiated. Accordingly, three special radiological air monitoring stations were constructed offsite, near Hanford's perimeter. Each station is managed and operated by two local school teachers. These three stations are the beginning of a community-operated environmental surveillance program that will ultimately involve the public in most surveillance operations around the Site. The program was designed to stimulate interest in Hanford environmental surveillance operations, and to help the public better understand surveillance results. The program has also been used to enhance educational opportunities at local schools.

3035 (PNL-SA-23687) Hanford technology integration: A success story. Stenehjem, E.J.; Pond, D.J.; Widrig, J.E.; Deonigi, D.E. Pacific Northwest Lab., Richland, WA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225-125: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 Mar 1994). Order Number DE95001431. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes recent activities of the Richland Northwest Laboratory in the area of technology transfer. A major thrust within major DOE laboratories has been the implementation of technology transfer activities which transfer scientific knowledge, transfer technologies developed to deal with the production or conservation of energy, and transfer spinoff technologies into the private sector. Several activities which are in process or have been implemented are described in this paper.

3036 (PNL-SA-23788) The seven main steps of the DQO planning process. Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94014555. Source: OSTI; NTIS; GPO Dep.

The Data Quality Objectives (DQO) Planning Process (DQOPP) involves seven steps. Each step requires that all persons who might be able to influence that step's program before it is completed become involved. Those with such influence include representatives from: program managers, who define the overall remediation project; regulators, who set standards for the remediation; line managers, who use data to design and guide the remediation; data suppliers, who collect and analyze the samples; DQO specialists, who help to guide the technical planning in the DQOPP. At the end of each step, a document is prepared that describes the elements needed in that step. Each participant must sign the document to show concurrence. A brief description of the seven steps is presented in this document.

3037 (PNL-SA-23839) The Environmental and Molecular Sciences Laboratory project - Continuous evolution in leadership. Knutson, D.E.; McClusky, J.K. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941091-3: 25. Project Management Institute annual seminar and symposium, Vancouver (Canada), 17-19 Oct 1994). Order Number DE95004572. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental and Molecular Sciences Laboratory (EMSL) construction project at Pacific Northwest Laboratory (PNL) in Richland, Washington, is a \$230M Major Systems

Acquisition for the US Department of Energy (DOE). The completed laboratory will be a national user facility that provides unparalleled capabilities for scientists involved in environmental molecular science research. This project, approved for construction by the Secretary of Energy in October 1993, is underway. The United States is embarking on an environmental cleanup effort that dwarfs previous scientific enterprise. Using current best available technology, the projected costs of cleaning up the tens of thousands of toxic waste sites, including DOE sites, is estimated to exceed one trillion dollars. The present state of scientific knowledge regarding the effects of exogenous chemicals on human biology is very limited. Long term environmental research at the molecular level is needed to resolve the concerns, and form the building blocks for a structure of cost effective process improvement and regulatory reform.

3038 (PNL-SA-23947) Transparent access to distributed, heterogeneous environmental information systems. Brown, J.C.; Kissinger, B.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409293-1: 5. international conference on database and expert systems applications, Athens (Greece), 7-9 Sep 1994). Order Number DE95007268. Source: OSTI; NTIS; GPO Dep.

Quality situation assessment and decision making require access to multiple sources of data and information. The question facing today's analyst is not so much "Is the data I need to do my work available?" as "How can I get to the data I need to make an informed decision?" Insufficient accessibility to data exists for many large corporations and Government agencies. By utilizing current advances in computer technology, today's situation analysts have a wealth of information at their disposal. There are many potential solutions to the information accessibility problem using today's technology. The United States Department of Energy (USDOE) faced this situation when dealing with the problem of high level radioactive waste (HLW) tanks in the United States. The result of their efforts has been the creation of the Tank Waste Information Network System - TWINS. The TWINS solution combines many technologies to address problems in several areas such as user interfaces, transparent access to multiple data sources, and integrated data access. Data related to the HLW tank complex is currently distributed throughout several US-DOE installations. Over time, each installation has adopted its own set of standards for information management, hardware, and software platforms. These factors contribute to the complexity of accessing information in a manner that enhances the performance and decision making process of the analysts. This paper presents one approach taken by the US-DOE to resolve the problem of distributed, heterogeneous, multimedia information management through the development of multilevel architectural controls and access mechanisms for the HLW Tank complex. The information system architecture developed for the US-DOE by the TWINS effort is one that is adaptable to other problem domains and uses.

3039 (PNL-SA-24157) West Siberian basin hydrogeology - regional framework for contaminant migration from injected wastes. Foley, M.G. Battelle Pacific Northwest Lab., Richland, WA (United States). May 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9405185-1: International symposium on the scientific and engineering

aspects of deep injection disposal of hazardous and industrial wastes, Berkeley, CA (United States), 10-13 May 1994). Order Number DE94014494. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear fuel cycle activities of the former Soviet Union (FSU) have resulted in massive contamination of the environment in western Siberia. We are developing three-dimensional numerical models of the hydrogeology and potential contaminant migration in the West Siberian Basin. Our long-term goal at Pacific Northwest Laboratory is to help determine future environmental and human impacts given the releases that have occurred to date and the current waste management practices. In FY 1993, our objectives were to (1) refine and implement the hydrogeologic conceptual models of the regional hydrogeology of western Siberia developed in FY 1992 and develop the detailed, spatially registered digital geologic and hydrologic databases to test them, (2) calibrate the computer implementation of the conceptual models developed in FY 1992, and (3) develop general geologic and hydrologic information and preliminary hydrogeologic conceptual models relevant to the more detailed models of contaminated site hydrogeology. Calibration studies of the regional hydrogeologic computer model suggest that most precipitation entering the ground-water system moves in the near-surface part of the system and discharges to surface waters relatively near its point of infiltration. This means that wastes discharged to the surface and near-surface may not be isolated as well as previously thought, since the wastes may be carried to the surface by gradually rising ground waters.

3040 (PNL-SA-24231) Hanford Site's Integrated Risk Assessment Program: No-intervention risk assessment. Mahaffey, J.A. (and others); Dukelow, J.S. Jr.; Stenner, R.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-91: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017803. Source: OSTI; NTIS; INIS; GPO Dep.

The long-term goal of the Integrated Risk Assessment program (IRAP) is to estimate risks to workers, the public, organizations, and groups with reserved rights to Site access, the ecosystem, and natural resources to aid in managing environmental restoration and waste management at the Hanford Site. For each of these, information is needed about current risks, risks during cleanup, and endstate risks. The objective is three-fold: to determine if and when to remediate, and to what extent; to identify information unavailable but needed to make better cleanup decisions; to establish technology performance criteria for achieving desired cleanup levels; to understand costs and benefits of activities from a Site-wide perspective. The no-intervention risk assessment is the initial evaluation of public health risks conducted under IRAP. The objective is to identify types of activities that the US Department of Energy (DOE) must accomplish for closure of the Hanford Site, defined as no further DOE intervention. There are two primary conclusions from the no-intervention risk assessment. First, some maintenance and operations activities at Hanford must be continued to protect the public from grave risks. However, when large Hanford expenditures are compared to cleanup progress, funds expended for maintenance and operations must be put in proper perspective. Second, stakeholder's emphasis on public risks at Hanford, as indicated by remediation priorities, are not in line with those estimated. The

focus currently is on compliance with regulations, and on dealing with issues which are visible to stakeholders.

3041 (PNL-SA-24404) Integrated demonstrations, integrated programs, and special programs within DOE's Office of Technology Development. Peterson, M.E.; Frank, C.; Stein, S.; Steele, J. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815-86: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017456. Source: OSTI; NTIS; INIS; GPO Dep.

This poster session presents information on integrated demonstrations, integrated programs, and special programs within the EM Office of Technology Development that will accelerate cleanup of sites within the Nuclear Weapons Complex. Presented topics include: Volatile organic compounds in soils and ground water, uranium in soils, underground storage tanks, mixed waste landfills, decontamination and decommissioning, in situ remediation, and separations technology.

3042 (PNL-SA-24419) Pacific Northwest Laboratory environmental technologies available for deployment. Slate, S.C. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94015205. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy created the Office of Environmental Management (EM) to conduct a 30-year plus, multi-billion dollar program to manage the wastes and cleanup the legacy from over fifty years of nuclear material production. Across the DOE System there are thousands of sites containing millions of metric tons of buried wastes and contaminated soils and groundwater. Additionally, there are nearly 400,000 m³ of highly radioactive wastes in underground storage tanks, over 1,400 different mixed-waste streams, and thousands of contaminated surplus facilities, some exceeding 200,000 m² in size. Costs to remediate all these problems have been estimated to be as much as several hundred billion dollars. The tremendous technical challenges with some of the problems and the high costs of using existing technologies has led the Department to create the Office of Technology Development (TD) to lead an aggressive, integrated national program to develop and deploy the needed advanced, cost-effective technologies. This program is developing technologies for all major cleanup steps: assessment, characterization, retrieval, treatment, final stabilization, and disposal. Work is focused on the Department's five major problem areas: High-Level Waste Tank Remediation; Contaminant Plume Containment and Remediation; Mixed Waste Characterization, Treatment, and Disposal; Contaminated Soils and Buried Wastes Facility Transitioning, Decommissioning, and Final Disposal.

3043 (PNL-SA-24743) Information system architecture to support transparent access to distributed, heterogeneous data sources. Brown, J.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940873-4: 11. office information technology conference, Chicago, IL (United States), 23-25 Aug 1994). Order Number DE94018450. Source: OSTI; NTIS; INIS; GPO Dep.

Quality situation assessment and decision making require access to multiple sources of data and information. Insufficient accessibility to data exists for many large corporations and Government agencies. By utilizing current advances in computer technology, today's situation analyst's have a wealth of information at their disposal. There are many potential solutions to the information accessibility problem using today's technology. The United States Department of Energy (US-DOE) faced this problem when dealing with one class of problem in the US. The result of their efforts has been the creation of the Tank Waste Information Network System - TWINS. The TWINS solution combines many technologies to address problems in several areas such as User Interfaces, Transparent Access to Multiple Data Sources, and Integrated Data Access. Data related to the complex is currently distributed throughout several US-DOE installations. Over time, each installation has adopted their own set of standards as related to information management. Heterogeneous hardware and software platforms exist both across the complex and within a single installation. Standards for information management vary between US-DOE mission areas within installations. These factors contribute to the complexity of accessing information in a manner that enhances the performance and decision making process of the analysts. This paper presents one approach taken by the DOE to resolve the problem of distributed, heterogeneous, multi-media information management for the HLW Tank complex. The information system architecture developed for the DOE by the TWINS effort is one that is adaptable to other problem domains and uses.

3044 (PNL-SA-24754) Automated remedial assessment methodology software system. Whiting, M.; Wilkins, M.; Stiles, D. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941113-2: Conference on development and application of computer techniques to environmental studies: Envirosoft '94, San Francisco, CA (United States), 16-18 Nov 1994). Order Number DE95007287. Source: OSTI; NTIS; INIS; GPO Dep.

The Automated Remedial Analysis Methodology (ARAM) software system has been developed by the Pacific Northwest Laboratory to assist the U.S. Department of Energy (DOE) in evaluating cleanup options for over 10,000 contaminated sites across the DOE complex. The automated methodology comprises modules for decision logic diagrams, technology applicability and effectiveness rules, mass balance equations, cost and labor estimating factors and equations, and contaminant stream routing. ARAM is used to select technologies for meeting cleanup targets; determine the effectiveness of the technologies in destroying, removing, or immobilizing contaminants; decide the nature and amount of secondary waste requiring further treatment; and estimate the cost and labor involved when applying technologies.

3045 (PNL-SA-24993) Four-dimensional information visualization and analysis system. Rex, B. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409278-1: GVIS '94: graphics and visualization conference, Richland, WA (United States), 8 Sep 1994). Order Number DE95004935. Source: OSTI; NTIS; INIS; GPO Dep.

4DIVAS was conceived for two purposes. The first purpose was to fill the void between the current generation of

GIS and high-end, image-only visualization systems. The gap existing between these two systems can be summarized as the limitation of relational database oriented GIS to deal with time and the poor connection in visualization systems to databases of any kind. The second purpose was to permit spatio-temporal modeling and query, functionalities currently underdeveloped in the commercial arena. At the Hanford Site, there are many potential applications for such a system, especially in the monitoring and modeling of potential constituent plumes in the subsurface hydrology over time, among others. In its current form, 4DIVAS exists as a proof-of-concept functional prototype and is therefore more of a technology than a product at this time.

3046 (SAND-94-2061) Report on the Workshop on Port Selection Criteria for Shipments of Foreign Research Reactor Spent Nuclear Fuel. Massey, C.D. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95011024. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the results of the Workshop on Port Selection Criteria for Shipments of Spent Nuclear Fuel. The workshop was held at the United States Merchant Marine Academy in Kings Point, New York on November 15 and 16, 1993. The workshop panel of maritime experts developed criteria for the US Department of Energy for the evaluation and selection of ports of entry for spent-fuel shipments. While recommending criteria for selecting ports, the workshop panel agreed that any port capable of handling an ocean-going vessel is capable of safely receiving spent nuclear fuel.

3047 - (SAND-94-2272C) A phased approach to cooperative environmental management R&D projects with Russian Institutes. Matalucci, R.V. (Sandia National Labs., Albuquerque, NM (United States)); Albert, T.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409217-1: 1. international environmental technology and business action conference, Moscow (Russian Federation), 12-16 Sep 1994). Order Number DE95000546. Source: OSTI; NTIS; INIS; GPO Dep.

An important aspect of technology exchange between the US and the Former Soviet Union (FSU) countries is the identification and implementation of cooperative projects that are mutually beneficial. The US Department of Energy (DOE) and its national laboratories have established a four-phase approach to identify and further develop Russian technologies that could contribute to solving DOE environmental management problems. Following an initial screening and identification of potential technologies, the country-to-country interaction is formally initiated in the first phase through a small-scale pilot project study. This phase consists of an evaluation of the specific technology for DOE applications, and provides an opportunity for both US and Russian scientists and engineers to validate the use of the technology for a specific DOE requirement. The successful completion of this phase establishes the basis for continuing the technology development into the second phase, which includes laboratory testing in Russia. In the third phase, the technology is laboratory tested in the US, most likely at those DOE national laboratories having the capability and greatest interest in the particular technology area. The fourth and final phase consist of a commercialization process that establishes a partnership with a US business to

finalize development of the technology and to prepare for implementation within the DOE complex. An example of this phased approach is a current high-level waste separation cooperative project between the Khlopin Radium Institute and the DOE through Sandia National Laboratories (SNL) and Science Applications International Corporation (SAIC). This effort has not only enhanced separations technology for the DOE, but has also provided an example of a working process for future cooperative projects.

3048 (SAND-94-2275C) Application of EnviroTRADE Information system for the cleanup of the former Soviet Union (FSU) site at Komarom Base, Hungary. Matalucci, R.V. (Sandia National Labs., Albuquerque, NM (United States)); Harrington, M.W.; Harlan, C.P.; Kuperberg, J.M.; Biczko, I.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940983-3: 2. international symposium and exhibition on environmental contamination in Central and Eastern Europe, Budapest (Hungary), 20-23 Sep 1994). Order Number DE95000535. Source: OSTI; NTIS; INIS; GPO Dep.

During a NATO Advanced Research Workshop (ARW) held in Visegrad, Hungary, June 21-23, 1994, portions of contamination data from the Former Soviet Union (FSU) site at Komarom, Hungary were used to demonstrate the international EnviroTRADE Information System as a tool to assist with the identification of alternative cleanup measures for contaminated sites. The NATO ARW was organized and conducted by the joint Florida State University and the Technical University of Budapest, Center for Hungarian-American Environmental Research, Studies, and Exchanges (CHAERSE). The purpose of the workshop was to develop a strategy for the identification and selection of appropriate low-cost and innovative site remediation technologies and approaches for a typical abandoned FSU site. The EnviroTRADE information system is a graphical, photographic, and textual environmental management tool under development by the U.S. Department of Energy (USDOE) at Sandia National Laboratories (SNL) as a part of the cleanup program of the nuclear weapons complex. EnviroTRADE provides a single, powerful, multi-purpose, multi-user, multimedia, and interactive computer information system for worldwide environmental restoration and waste management (ER/WM). Graphical, photographic, and textual data from the Komarom FSU site were entered into EnviroTRADE. These data were used to make comparative evaluations of site characterization and remediation technologies that might be used to clean up primarily hydrocarbon contamination in the groundwater and soil. Available Hydrogeological and geological features, contaminated soil profiles, and topographical maps were included in the information profiles. Although EnviroTRADE is currently only partially populated (approximately 350 technologies for cleanup are included in the database), the utility of the information system to evaluate possible options for cleanup of the Komarom site has been demonstrated.

3049 (SAND-95-0570C) Benefits of Improved environmental cooperation on a joint DoD/DOE facility. Pratt, G.K. (Tetra Tech, Inc., Albuquerque, NM (United States)); Gibson, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950451-1: 21. national environmental symposium and exhibition, San Diego, CA (United States),

17-21 Apr 1995). Order Number DE95009584. Source: OSTI; NTIS; INIS; GPO Dep.

Numerous Federal facilities within the US involve multiple government agencies that face overlapping environmental concerns. This paper highlights the benefits of looking beyond the strict letter of environmental regulations that might affect a single tenant or environmental site to cooperative environmental efforts that focus on the entire facility, consistent with the missions of participating agencies. Using Kirtland Air Force Base (AFB) as a model, seven areas of Department of Defense (DoD) and Department of Energy (DOE) environmental cooperation are discussed that span technical, regulatory compliance, and administrative issues.

3050 (SAND-95-0828C) Radiological consequences of ship collisions that might occur in US ports during the shipment of foreign research reactor spent nuclear fuel to the US in break-bulk freighters. Sprung, J.L. (Sandia National Labs., Albuquerque, NM (United States)); Bepalko, S.J.; Johnson, J.D.; Massey, C.D.; Reardon, P.C.; Yoshimura, R.; Ebert, M.; Gallagher, D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216-132: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95010872. Source: OSTI; NTIS; INIS; GPO Dep.

Accident source terms, source term probabilities, consequences, and risks are developed for ship collisions that might occur in US ports during the shipment of spent fuel from foreign research reactors to the United States.

3051 (UCRL-JC-115613) On Integrating modeling software for application to total-system performance assessment. Lewis, L.C. (Lawrence Livermore National Lab., CA (United States)); Wilson, M.L. Lawrence Livermore National Lab., CA (United States). May 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940815-75: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94016361. Source: OSTI; NTIS; INIS; GPO Dep.

We examine the processes and methods used to facilitate collaboration in software development between two organizations at separate locations - Lawrence Livermore National Laboratory (LLNL) in California and Sandia National Laboratories (SNL) in New Mexico. Our software development process integrated the efforts of these two laboratories. Software developed at LLNL to model corrosion and failure of waste packages and subsequent releases of radionuclides was incorporated as a source term into SNLs computer models for fluid flow and radionuclide transport through the geosphere.

3052 (UCRL-JC-116577) International School of Innovative Technology for Cleaning the Environment, Ettore Majorana Centre for Scientific Culture: Erice, Sicily, Italy. Ragaini, R.C. Lawrence Livermore National Lab., CA (United States). Jun 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-920851-98: Spectrum '92: nuclear and hazardous waste management international topical meeting, Boise, ID (United States), 23-27 Aug 1992). Order Number DE94014729. Source: OSTI; NTIS; GPO Dep.

The International School of Innovative Technology for Cleaning the Environment was founded at the Ettore Majorana Centre for Scientific Culture (EMCSC), the seat of the

World Laboratory Mediterranean Branch, in 1989. The School primarily organizes and hosts training courses and advanced study courses addressing state-of-the-art technologies to clean the environment, minimize waste generation, prevent pollution, and identify strategies to choose environmentally resilient sites and processes for new industrial installations. The School also participates in facilitating multi-national research projects for developing countries under the auspices of the World Laboratory and other sponsoring agencies.

3053 (WHC-SA-2209) Calculating cost-training bill-back at WHC. Gardner, P.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931188-5: 17. annual training resources and data exchange conference: integrating training requirements and expectations, Indianapolis, IN (United States), 15-17 Nov 1993). Order Number DE95003272. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company, in an attempt to understand training costs and to find a make-or-buy tool for training, has constructed a Training Cost Estimator. Among the outputs of this Lotus program are projected numbers of instructor, managers, and secretarial staff, and cost per student ("tuition").

3054 (WHC-SA-2210) The Instructor-Free Training Department. Gardner, P.R. (Westinghouse Hanford Co., Richland, WA (United States)); Sanford, D.E. Westinghouse Hanford Co., Richland, WA (United States). Nov 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931188-4: 17. annual training resources and data exchange conference: integrating training requirements and expectations, Indianapolis, IN (United States), 15-17 Nov 1993). Order Number DE95003273. Source: OSTI; NTIS; GPO Dep.

Today's skills will be obsolete in the year 2000. That workforce will require a much higher degree of technical sophistication and adaptability. Enormous demands will be made of DOE contractor training departments even as federal deficit reduction actions increasingly restrict resources and as the emergence of electronic performance support systems appear to diminish the need for training. True training will still be required but they must, and can, train better, faster, and cheaper. These goals are attainable by implementing the implications of performance-based training and by focusing on learning instead of on teaching. (Indeed, ability to learn efficiently and rapidly will be the premier talent in the next century.) Training Departments must dedicate themselves to changing performance, not to teaching classes. The best training department of the future will have no "instructors". Trainingforce 2000 will look and function much differently.

3055 (WHC-SA-2282) Public agency partnership: Hanford's history artifacts as a communications tool. Gerber, M.S. Westinghouse Hanford Co., Richland, WA (United States). Feb 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940225-116: Waste management '94: working towards a cleaner environment, Tucson, AZ (United States), 27 Feb - 3 Mar 1994). Order Number DE94014127. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site in eastern Washington state currently is engaged in the largest waste cleanup in world history. In order to make informed decisions about remediation options,

the public throughout the Pacific Northwest and the nation needs to understand the wastes that are present, their sources of generation, their composition, and their behavior in the environment. The fact that Hanford operations' were conducted in secret for over four decades presents a unique public information challenge to those who currently are responsible for communicating with the public.

3056 (WHC-SA-2434) Generating custom test plans for CASE*Dictionary 5.0. Atkins, K.D. (Boeing Computer Services, Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9404143-2: Oracle CAS SIG spring '94 conference, Keystone, CO (United States), 23-26 Apr 1994). Order Number DE94018164. Source: OSTI; NTIS; GPO Dep.

Most database development organizations use a formal software development methodology that requires a certain amount of formal testing. The amount of formal testing that will be performed will vary from methodology to methodology and from site to site. If a very detailed formal test plan is required for each module in a system, the work involved to produce the test plan can be tedious and costly. After a system has been designed and developed using Oracle*CASE, there is much useful information in the CASE*Dictionary repository. If this information could be tied to specific test requirements, a test plan could be generated automatically, saving much time and resources. This paper shows how CASE*Dictionary can be used to store test plan information that can then be used to generate a specific test plan for each module based on its detailed data usage.

3057 (WHC-SA-2594) Measuring the strategic value of information technology investments. Conrad, K.W. (Boeing Computer Services Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940873-3: 11. office information technology conference, Chicago, IL (United States), 23-25 Aug 1994). Order Number DE94018160. Source: OSTI; NTIS; INIS; GPO Dep.

Value is often perceived differently by the proponents of new information technologies and those who allocate resources and define priorities. Such differences often become a roadblock to meeting true business needs. Project justifications regularly rely on calculated cost savings, which rarely measure the full benefit of new technologies. In fact, if cost savings provide a complete picture, then the organization is probably just automating routine clerical operations and has abandoned efforts that would provide significant strategic value. Strategic value is not limited to financial calculations, but includes quality, time and risk criteria. This paper describes approaches for measuring strategic value that can provide organizations with proven techniques to improve performance, reengineer processes, benchmark performance against other suppliers, identify outsourcing opportunities, or defend themselves from pressures to outsource. Many organizations respond to tightening budgets by cutting overhead. These measurement approaches can demonstrate how overhead is critical to organizational effectiveness and how cost savings can be found, instead, by measurably improving performance throughout the organization. Finally, the paper describes efforts underway within the Department of Energy and at the Hanford Site to implement the approaches described in this paper.

3058 (WHC-SA-2657) A pathway to academic accreditation. Seitz, M.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9410190-1: 18. annual training resources and data exchange conference: meeting line management expectations, Dallas, TX (United States), 31 Oct - 2 Nov 1994). Order Number DE95001313. Source: OSTI; NTIS; GPO Dep.

The pathways to successfully accrediting programs through a partnership with a local college can be convoluted and offer many dead ends. Those pathways can be made straighter and have fewer false starts by following a plan that has worked. Accreditation of courses and programs can add credibility and prestige to a program. The process can be facilitated by following a basic plan such as the one outlined. The discussion will track the preliminary activities that form the ground work for the beginning of the accreditation process through final approval by a college's State Board of trustees or regents. On the road to approval, the packaging of courses for presentation, the formulation and composition of an advisory committee, the subsequent use of the advisors, presentation to the faculty committees, the presentation to the college's governing board of trustees or regents, and final approval by the State Board are covered. An important benefit of accreditation is the formation of a partnership with the local college. Teaming with a local college to provide an accredited certificate in a field of employee training is an excellent opportunity to establish an educational partnership within the local community that will be of benefit to the participating entities. It also represents a training/retraining opportunity in direct support of the US Department of Energy's current missions of partnership and localization. The accredited modules can be taught where appropriate by college personnel or loaned instructors from the work site. By using the company employees who are working with the topics covered in the modules, the courses are kept up-to-date.

3059 (WHC-SA-2683) Advances in technology transfer at Federal Facilities. Silva, R.R. Jr. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9411139-1: Optimizing the technology transfer function, Chicago, IL (United States), 2-4 Nov 1994). Order Number DE95001534. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site, located in the southeast portion of the state of Washington, is a 1450-hectare (560 square miles) reservation that was selected by the US Government in 1942 for production of the world's first nuclear weapons materials. For more than 40 years, defense production operations at Hanford generated hazardous and radioactive materials and wastes that for the most part remain there today. Environmental restoration of the Hanford Site is the primary mission of the Westinghouse Hanford Company (WHC) and it is also the thrust of the Tri-Party agreement among the US Environmental Protection Agency, the Washington State Department of Ecology and the US Department of Energy. Restoration will require treatment of about 1400 individual locations that are contaminated by chemically hazardous wastes, radioactive wastes, non-hazardous wastes and mixed hazardous and radioactive wastes. These locations include burial sites, storage facilities, obsolete buildings, settling ponds, waste cribs and large and small areas of near-surface and deep soil contamination. Burial

trenches contain an estimated 109,000 cubic meters of low-level solid wastes contaminated with hazardous chemicals and radioactive materials. Approximately 450 sites were contaminated by discharge of liquids to the ground and there are about 250 additional areas where waste materials were spilled. At one time, ditches carried water from processing plants to settling/cooling ponds and 131 cribs were used over the years to dispose of slightly radioactive liquid wastes.

3060 (WHC-SA-2723) A model for determining when an analysis contains sufficient detail to provide adequate NEPA coverage for a proposed action. Eccleston, C.H. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006767. Source: OSTI; NTIS; INIS; GPO Dep.

Neither the National Environmental Policy Act (NEPA) nor its subsequent regulations provide substantive guidance for determining the Level of detail, discussion, and analysis that is sufficient to adequately cover a proposed action. Yet, decisionmakers are routinely confronted with the problem of making such determinations. Experience has shown that no two decisionmakers are likely to completely agree on the amount of discussion that is sufficient to adequately cover a proposed action. One decisionmaker may determine that a certain Level of analysis is adequate, while another may conclude the exact opposite. Achieving a consensus within the agency and among the public can be problematic. Lacking definitive guidance, decisionmakers and critics alike may point to a universe of potential factors as the basis for defending their claim that an action is or is not adequately covered. Experience indicates that assertions are often based on ambiguous opinions that can be neither proved nor disproved. Lack of definitive guidance slows the decisionmaking process and can result in project delays. Furthermore, it can also lead to inconsistencies in decisionmaking, inappropriate Levels of NEPA documentation, and increased risk of a project being challenged for inadequate coverage. A more systematic and less subjective approach for making such determinations is obviously needed. A paradigm for reducing the degree of subjectivity inherent in such decisions is presented in the following paper. The model is specifically designed to expedite the decisionmaking process by providing a systematic approach for making these determinations. In many cases, agencies may find that using this model can reduce the analysis and size of NEPA documents.

3061 (WHC-SA-2745) Lessons learned during the development and conduct of exercise Fermont. Faulk, S.M. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950430-3: 5. ANS topical meeting on emergency preparedness and response, Savannah, GA (United States), 18-21 Apr 1995). Order Number DE95004973. Source: OSTI; NTIS; INIS; GPO Dep.

On September 22-23, 1993, the DOE, Richland Operations Office (RL) in Richland, Washington conducted a major field exercise named Fremont. This exercise tested the ability of the Site emergency organization and the State and local emergency organizations in both Washington and Oregon to take the appropriate actions to mitigate a major emergency and to protect the citizens of the region. The exercise involved initial emergency activities as well as intermediate and late phase actions including relocation and

ingestion activities. A major element of the exercise was the participation of the Federal Radiological Monitoring and Assessment Center (FRMAC). This was the first major exercise that a DOE site requested a full FRMAC participation in a nonclassified environment.

3062 (WHC-SA-2753) An ugly duckling becomes a swan ...: How an organization becomes customer focused through listening. Asercion, R.E. (Boeing Computer Services Co., Richland, WA (United States)); Myer, V.J. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950464-1: 17. national industrial energy technology conference - serving industry's needs, in conjunction with the spring regional conference of the Gulf Coast Cogeneration Association, Houston, TX (United States), 4-6 Apr 1995). Order Number DE95004974. Source: OSTI; NTIS; GPO Dep.

The story we're about to tell is true and the names have not been changed to protect the innocent because BCS Richland, Inc. (BCSR), a subsidiary of the Boeing Company, is proud of its metamorphosis from the ugly duckling of computer support to the shining swan-like star of the Help Desk industry. The transformation occurred in the midst of an all but antiquated computer technology environment, rapid technology changes, low employee morale, and high amount of customer frustration. BCSR, located at the Hanford site in the southeastern corner of Washington State, provides information resource management and computer support to the Department of Energy (DOE) complex located at the site. The primary mission of DOE is environmental restoration and waste clean-up. End User Support (EUS), an organization within BCSR, is tasked with all aspects of microcomputer support, both hardware and software. EUS efficiently and effectively supports approximately 12,000 computer users across the entire 560 square mile site. With a small staff of 50 consultants and technicians, EUS provides support to a diverse customer base that includes engineers and scientists, as well as financial personnel, managers, and clerical support. But it wasn't always this way. BCSR management recognized it and empowered the EUS staff to make the necessary changes. Here's how they did it.

3063 (WHC-SD-CP-TR-006) Engineering Phase 2 and Phase 3 certification programs - PUREX deactivation. Walser, R.L. Westinghouse Hanford Co., Richland, WA (United States). 13 Dec 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005133. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the training programs required to become a Phase 2 and Phase 3 certified engineer at PUREX during deactivation. With the change in mission, the PUREX engineering/certification training program is being revamped as discussed below. The revised program will be administered by PUREX Technical Training using existing courses and training materials. The program will comply with the requirements of the Department of Energy (DOE) order 5480.20A, "Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities."

3064 (WHC-SD-GN-ISB-30001) Hanford Generic Interim Safety Basis. Lavender, J.C. Westinghouse Hanford Co., Richland, WA (United States). 9 Sep 1994. 392p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95001568. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to identify WHC programs and requirements that are an integral part of the authorization basis for nuclear facilities that are generic to all WHC-managed facilities. The purpose of these programs is to implement the DOE Orders, as WHC becomes contractually obligated to implement them. The Hanford Generic ISB focuses on the institutional controls and safety requirements identified in DOE Order 5480.23, Nuclear Safety Analysis Reports.

3065 (WHC-SD-T100-CDR-001) Conceptual design report, Hazardous Materials Management and Emergency Response (HAMMER) Training Center. Kelly, K.E. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Montgomery Watson, Richland, WA (United States). 9 Nov 1994. 398p. Sponsored by USDOE, Washington, DC (United States); Department of Defense, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003852. Source: OSTI; NTIS; INIS; GPO Dep.

For the next 30 years, the main activities at the US Department of Energy (DOE) Hanford Site will involve the management, handling, and cleanup of toxic substances. If the DOE is to meet its high standards of safety, the thousands of workers involved in these activities will need systematic training appropriate to their tasks and the risks associated with these tasks. Furthermore, emergency response for DOE shipments is the primary responsibility of state, tribal, and local governments. A collaborative training initiative with the DOE will strengthen emergency response at the Hanford Site and within the regional communities. Local and international labor has joined the Hazardous Materials Management and Emergency Response (HAMMER) partnership, and will share in the HAMMER Training Center core programs and facilities using their own specialized trainers and training programs. The HAMMER Training Center will provide a centralized regional site dedicated to the training of hazardous material, emergency response, and fire fighting personnel.

3066 (WHC-SD-T100-FDC-001-Rev.1) Functional design criteria for the Hazardous Materials Management and Emergency Response (HAMMER) Training Center. Revision 1. Sato, P.K. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009096. Source: OSTI; NTIS; INIS; GPO Dep.

Within the United States, there are few hands-on training centers capable of providing integrated technical training within a practical application environment. Currently, there are no training facilities that offer both radioactive and chemical hazardous response training. There are no hands-on training centers that provide training for both hazardous material operations and emergency response that also operate as a partnership between organized labor, state agencies, tribes, and local emergency responders within the US Department of Energy (DOE) complex. Available facilities appear grossly inadequate for training the thousands of people at Hanford, and throughout the Pacific Northwest, who are required to qualify under nationally-mandated requirements. It is estimated that 4,000 workers at the Hanford Site alone need hands-on training. Throughout the Pacific Northwest, the potential target audience would be over 30,000

public sector emergency response personnel, as well as another 10,000 clean-up workers represented by organized labor. The HAMMER Training Center will be an interagency-sponsored training center. It will be designed, built, and operated to ensure that clean-up workers, fire fighters, and public sector management and emergency response personnel are trained to handle accidental spills of hazardous materials. Training will cover wastes at clean-up sites, and in jurisdictions along the transportation corridors, to effectively protect human life, property, and the environment.

3067 (WHC-SD-T100-PLN-001) Project plan, Hazardous Materials Management and Emergency Response Training Center: Project 95L-EWT-100. Borgeson, M.E. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003850. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Materials Management and Emergency Response (HAMMER) Training Center will provide for classroom lectures and hands-on practical training in realistic situations for workers and emergency responders who are tasked with handling and cleanup of toxic substances. The primary objective of the HAMMER project is to provide hands-on training and classroom facilities for hazardous material workers and emergency responders. This project will also contribute towards complying with the planning and training provisions of recent legislation. In March 1989 Title 29 Code of Federal Regulations Occupational Safety and Health Administration 1910 Rules and National Fire Protection Association Standard 472 defined professional requirements for responders to hazardous materials incidents. Two general types of training are addressed for hazardous materials: training for hazardous waste site workers and managers, and training for emergency response organizations.

3068 (WHC-SD-T100-PMP-001) Project management plan, Hazardous Materials Management and Emergency Response Training Center. Borgeson, M.E. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005288. Source: OSTI; NTIS; INIS; GPO Dep.

For the next 30 years, the main activities at the Hanford Site will involve the handling and cleanup of toxic substances. Thousands of workers involved in these new activities will need systematic training appropriate to their tasks and associated risks. This project is an important part of the Hanford Site mission and will enable the US Department of Energy (DOE) to meet high standards for safety. The Hazardous Materials Management and Emergency Response Training Center (HAMMER) project will construct a centralized regional training center dedicated to training hazardous materials workers and emergency responders in classrooms and with hands-on, realistic training aids representing actual field conditions. The HAMMER Training Center will provide a cost-effective, high-quality way to meet the Hanford Site training needs. The training center creates a partnership among DOE; government contractors; labor; local, state, and tribal governments; and selected institutions of higher education.

3069 (WHC-SD-T100-QAPP-001) Project T100 - Hazardous Materials Management and Emergency

Response Training Center (HAMMER). Norton, C.E. Westinghouse Hanford Co., Richland, WA (United States). 9 Nov 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003772. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this Quality Assurance Program Plan (QAPP) is to provide a system of Quality Assurance reviews and verifications on the design and construction of the Hazardous Materials Management and Emergency Response (HAMMER) Training Center, project 95L-EWT-100 at Hanford. The reviews and verifications will be on activities associated with design, procurement, and construction of the HAMMER project which includes, but is not limited to earthwork, placement of concrete, laying of rail, drilling of wells, water and sewer line fabrication and installation, communications systems, fire protection/detection systems, line tie-ins, building and mock-up (prop) construction, electrical, instrumentation, pump and valves and special coatings.

3070 (WHC-SD-WM-CM-012) Configuration management plan for the GENII software. Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005163. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

The GENII program calculates doses from radionuclides released into the environment for a variety of possible exposure scenarios. The user prepares an input data file with the necessary modelling assumptions and parameters. The program reads the user's input file, computes the necessary doses and stores these results in an output file. The output file also contains a listing of the user's input and gives the title lines from the data libraries which are accessed in the course of the calculations. The purpose of this document is to provide users of the GENII software with the configuration controls which are planned for use by WHC in accordance with WHC-CM-3-10. The controls are solely for WHC employees. Non-WHC individuals are not excluded, but no promise is made or implied that they will be informed of errors or revisions to the software. The configuration controls cover the GENII software, the GENII user's guide, the list of GENII users at WHC, and the backup copies. Revisions to the software must be approved prior to distribution in accordance with this configuration management plan.

3071 (WHC-SD-WM-TR-024-Rev.1) B Plant Complex waste management training plan: Revision 1. Beam, T.G. Westinghouse Hanford Co., Richland, WA (United States). 24 Oct 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003228. Source: OSTI; NTIS; INIS; GPO Dep.

This training program is designed to comply with all applicable federal, state and US Department of Energy-Richland Operations Office training requirements. The training program complies with requirements contained within WAC 173-303-330 for the development of a written dangerous waste training program. The training program is designed to prepare personnel to manage and maintain waste treatment, storage and disposal (TSD) units, as well as generator units, in a safe, effective, efficient and environmentally sound manner. In addition to preparing employees to manage and maintain TSD and generator units under normal conditions, the training program ensures that employees are prepared to respond in a prompt and effective manner should an emergency occur. The training plan also identifies specific

individuals holding key waste management positions at B Plant Complex.

3072 (WHC-SP-1096) Planning integration FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP). Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 937p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001249. Source: OSTI; NTIS; INIS; GPO Dep.

This Multi-Year Program Plan (MYPP) for the Planning Integration Program, Work Breakdown structure (WBS) Element 1.8.2, is the primary management tool to document the technical, schedule, and cost baseline for work directed by the US Department of Energy (DOE), Richland Operations Office (RL). As an approved document, it establishes a binding agreement between RL and the performing contractors for the work to be performed. It was prepared by the Westinghouse Hanford Company (WHC) and the Pacific Northwest Laboratory (PNL). This MYPP provides a picture from fiscal year 1995 through FY 2001 for the Planning Integration Program. The MYPP provides a window of detailed information for the first three years. It also provides 'execution year' work plans. The MYPP provides summary information for the next four years, documenting the same period as the Activity Data Sheets.

3073 (WHC-SP-1098) Proposal for the International Atomic Energy Agency Training Course. McCarthy, T.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018162. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site has hosted similar activities, including both Hanford Summits I and II. The Hanford Summits were two-day televised events to discuss the commitment of the current Presidential administration to the environmental restoration of the Hanford Site. Public involvement and strategic issues established from Hanford Summit I include: Regulatory issues, training and education, economic development and partnership, and technology transfer. Hanford Summit II provided a summary of how Secretary of Energy O'Leary is proceeding on the above strategic issues. The DOE and Westinghouse School for Environmental Excellence frequently offers a six-week course for environmental professionals and workers. Approximately thirty to forty individuals attend the training course, which provides training in environmental regulation compliance. The Hanford Site has hosted two previous International Atomic Energy Agency training courses. The courses lasted two weeks and had approximately eight to ten participants. Nuclear Material Management and Neutron Monitoring were the courses hosted by the Hanford Site.

3074 (WHC-SP-1109) Budget FY 1995 site support program plan WBS 6.10.1. Wemhoff, G.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001316. Source: OSTI; NTIS; GPO Dep.

This is the program plan of Budget for the fiscal year 1995 site support. The topics of the program plan include a general mission statement, the primary customers, major activities performed to deliver products and services, program priorities, goals and objectives, assumptions, issues and constraints, performance measures, work breakdown

structure and responsibility assignment matrix, description of activities and milestone list.

3075 (WSRC-TR-94-0328) Commercial Integration and partnering at Savannah River Site. Steele, J.R. (Westinghouse Savannah River Co., Aiken, SC (United States)); Babione, R.A.; Shikashio, L.A.; Wacaster, A.J.; Paterson, A.D. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1994. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94016694. Source: OSTI; NTIS; GPO Dep.

Savannah River Site (SRS), particularly the Savannah River Technology Center (SRTC) with the experience from the first successful Integrated Technology Demonstration, can provide an excellent foundation for meeting DOE-EM's objectives with the new DOE-EM five focus area approach. With this in mind, SRTC established an activity to pursue full commercialization of environmental technologies. This report is an assessment of the status of commercialization at SRS and provides recommendations for enhancement as well as some tools critical to implementation. A review was made of the current situation at SRS with regards to taking technology development to commercial fruition. This was done from the perspective of comparing it to known commercialization models and processes. It was found that SRTC already works through many of the steps in these processes. With integration and action-oriented efforts of the inclusion of business and market factors, SRTC could become an aggressive, successful developer of commercialized technologies. Commercial success criteria tools were developed with regards to integrating them with SRTC selection criteria to ensure that all critical factors are covered in technology commercialization project evaluations. Private investors are very clear that their interest lies in funding commercial enterprises, not merely technologies. Mobilizing private capital is critical to real job growth and long-term economic development. Also, potential industry partners were identified that are willing to be involved with SRS' technology applications and regional development efforts. As another important component to success, regional support organizations were reviewed and evaluated.

3076 The California Surveying Engineering Name Survey. Crossfield, J.K. (California State Univ., Fresno, CA (United States)); Watkins, R. pp. 67-72 of 1994 ASPRS/ACSM annual convention & exposition. Volume 2. American Society for Photogrammetry and Remote Sensing, Bethesda, MD (United States) (1994). pp. 363 (CONF-9404153-: 1994 annual convention and exposition of the American Society for Photogrammetry and Remote Sensing (ASPRS) and the American Congress on Surveying and Mapping (ACSM), Reno, NV (United States), 25-28 Apr 1994).

More than 1400 high school students from throughout California responded to the 1993 California Surveying Engineering Names Survey. The purpose of the questionnaire was to determine the general appeal of the name Surveying Engineering and 6 different synonyms for that name with respect to other engineering discipline names. Part I of this effort dealt only with descriptions of engineering careers to see if the relative order with which engineering career descriptions were placed on a page made any difference. Descriptions placed at the bottom of the page did better than descriptions placed at the top. Part II listed career names only. Surveying and its synonyms were positioned

fourth on all forms. Surveying synonyms Geographic Engineering and Geographical Engineering rated first and second and Surveying Engineering rated last against the other 4 discipline names. Part III listed names and descriptions. Again seven different surveying synonyms were used in the fourth spot on each of these questionnaires. Geomatic Engineering was the strongest surveying synonym placing third against the other four disciplines. 3 refs., 1 tab.

3077 Fully distributed parallel algorithms - molecular self-consistent field calculations. Harrison, R.J. (Pacific Northwest Lab., Richland, WA (United States)). pp. 468, Paper COMP 14 of 207th ACS national meeting. American Chemical Society, Washington, DC (United States) (1994). pp. 2247 DOE Contract AC06-76RL01830. (CONF-940301-: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994).

The author discusses fundamental issues in the scaling of algorithms to massively parallel machines, with special emphasis on efficient usage of memory. He discusses the new portable tools that support multiple instruction multiple data computation with distributed data structures, with self consistent field and other ab initio electronic structure algorithms as examples. To date the most efficient parallel SCF algorithms have been based on replication within each processor of several $O(N)$ matrices (N , the number of basis functions). This limits the maximum calculation size and forces an unacceptably low ratio of processors to memory (i.e., most of your money is spent on memory, not processors). A simple and classical strip-mining algorithm suffices to achieve an efficient and scalable Fock matrix construction where all matrices are fully distributed. No redundant integrals are computed and the computation is dynamically load balanced. By strip-mining by atoms, the authors also exploit all available sparsity and pave the way for adopting more sophisticated methods for summation of the coulomb and exchange interactions.

3078 The US nuclear safety approach to upgrading the Russian and Ukrainian reactors. Baron, S. (Brookhaven National Lab., Upton, NY (United States)). pp. 49-52 of Nuclear power plant safety standards: towards international harmonization: Proceedings. Mechanical Engineering Publications Ltd., London (United Kingdom) (1993). pp. 320 (CONF-931012-: International conference on nuclear power plant safety standards: towards international harmonization, London (United Kingdom), 26-28 Oct 1993).

Brookhaven National Laboratory reporting to the Department of Energy has the technical and administrative management responsibilities for improving the operational and design safety systems of RBMK and the VVER reactors in Russia and the Ukraine. U.S. experts and industry interact with the Russian/Ukraine designers and operators to jointly develop the detailed requirements for system upgrades. When available, indigenous equipment and materials will be utilized. The construction and installation of most upgrades will be accomplished by Russia and the Ukraine with U.S. support and participation. This will maximize technology transfer, provide funds to U.S. and recipient country industry, and limit the nuclear liability of U.S. industry. (author).

3079 Partnership for Environmental Technology Education (PETE). Dickinson, P.R. (Lawrence Livermore National Lab., Livermore, CA (United States)). pp. 121-129 of Ninth annual environmental management and technology conference, West/Fall: Technical papers. Advanstar Expositions, Glen Ellyn, IL (United States) (1993). pp. 390

(CONF-9311169--: HazMat West '93: 9th annual environmental management and technology conference, Long Beach, CA (United States), 16-18 Nov 1993).

The need for broad cooperative effort directed toward the enhancement of science and mathematics education in the US has been recognized as a national priority by government, industry and the academic community alike. Within the context of this broad need, the US Department of Energy (DOE), the US Environmental Protection Agency (EPA), and the Department of Defense (DOD) have defined "needs driven" or specific interests which require increasing the numbers of qualified graduates in areas of environmental science, engineering and management, including technicians, and fostering improved public literacy in environmental science and waste management. Carefully targeted education intervention programs are required if these important goals are to be realized. The Partnership for Environmental Technology Education, a regional program which is now being extended nationally, has been developed and implemented to link the technical resources of federal laboratories and the private sector with regional community colleges to provide direct technical assistance for: development and presentation of environmental-hazardous materials and related technician curricula at the two-year degree/certificate level; and development/enhancement of environmental science and pre-engineering curricula targeting the attraction and preparation of transfer students to four-year institutions.

3080 Innovative approaches to public participation.
Conway, S. (Colorado Center for Environmental Manage-

ment, Golden, CO (United States)). pp. 1051-1054 of HMC/ Superfund '92. Hazardous Materials Control Resources Institute, Greenbelt, MD (United States) (1992). pp. 1150 (CONF-921235--: Hazardous Materials Control/Superfund '92: 13th annual conference and exhibition, Washington, DC (United States), 1-3 Dec 1992).

Effective means of assuring public involvement and regulatory compliance are a key-and frequently missing-component in hazardous waste cleanup. Recognizing this and realizing that the failure to integrate public participation and regulatory issues has impeded their own cleanups, the US Department of Energy has funded a 7-year grant to the Colorado Center for Environmental Management's Technology/Regulatory Integration Project (TRIP). The project's goal is to design and test more effective models for assuring public input and timely regulatory review to be used at DOE sites throughout the country. A particular focus of the project is to look at how these factors affect the use of innovative cleanup technologies. This paper summarizes the activities and preliminary findings of TRIP's first year. Central to developing more effective models is a series of studies of hazardous waste sites throughout the country and national issues related to cleanup. The paper documents the "lessons learned" from these studies and recommends ways to assure effective public participation in decision-making for hazardous waste cleanup.

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	94:956	ORNL/TM-12800		94:2974	CONF-9410300-1
	94:1720	CONF-940225-114		94:2995	ES/ER/TM-56/V1
	94:1721	CONF-940225-120		94:2996	ES/ER/TM-56/V2
	94:1722	CONF-940225-121		94:2997	ES/ER/TM-104
	94:1723	CONF-940815-5		94:2999	ES/ER/TM-120/V1
	94:1724	CONF-940983-5		94:3000	ES/ER/TM-120/V2
	94:1725	CONF-941124-8		94:3001	ES/ER/TM-120/V3
	94:1921	CONF-940406-13		94:3023	ORNL/M-4156
	94:1922	CONF-940809-6		94:3024	ORNL/TM-12724
	94:1957	DOE/OR-01-1117/V4		94:3025	ORNL/TM-12774
	94:1958	DOE/OR-01-1173-D2		Battelle Pacific Northwest Lab., Richland, WA (United States)	
	94:1959	DOE/OR-01-1226/V2		94:2073	PNL-10133
	94:1960	DOE/OR-01-1268/V2-D1		Oak Ridge Y-12 Plant, TN (United States)	
	94:1962	DOE/OR-01-1273/V1-D2		94:537	DOE/OR-01-1161/V1-D2
	94:1963	DOE/OR-01-1273/V2-D1		94:542	DOE/OR-01-1268/V1-D1
	94:1964	DOE/OR-01-1292-D1		94:1961	DOE/OR-01-1273/V1-D1
	94:1965	DOE/OR-01-1292-D2		Oak Ridge National Lab., TN (United States). Engineering Div.	
	94:2053	ORNL-6844		94:2059	ORNL/ER-239
	94:2054	ORNL-6846		Oak Ridge National Lab., TN (United States). Environmental Sciences Div.	
	94:2055	ORNL/ER-167		94:135	ORNL/ER-213/R1
	94:2057	ORNL/ER-226		94:140	ORNL/ER-269
	94:2058	ORNL/ER-235		94:536	DOE/OR-01-1158
	94:2060	ORNL/ER-241		Gilbert/Commonwealth, Inc., Reading, PA (United States)	
	94:2061	ORNL/ER-280		94:1838	DOE/OR-01-1313-D1
	94:2062	ORNL/ER-282		Department of Energy, Oak Ridge, TN (United States). Oak Ridge Operations Office	
	94:2063	ORNL/ER-288		94:63	DOE/OR-01-1252-D2
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	94:2066	ORNL/TM-12390		94:2427	DOE/HWP-130
	94:2071	ORNL/TM-12906			
	94:2300	CONF-9310355-1			
	94:2301	CONF-9310358-1			
	94:2302	CONF-940550-14			

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	94:529	DOE/MWIP-5	AC05-86ER80403		Oak Ridge National Lab., TN (United States)
	Pacific Northwest Lab., Richland, WA (United States)			94:2308	CONF-950232-21
	94:1872	PNL-SA-24382	AC05-91OR21928		Ebasco Services, Inc., Oak Ridge, TN (United States)
	Bechtel National, Inc., Oak Ridge, TN (United States)			94:2056	ORNL/ER-216
	94:2064	ORNL/ER/Sub-87- 99053/72	AC05-92OR21972		Fernald Environmental Restoration Man- agement Corp., Cincinnati, OH (United States). Fernald Environmental Man- agement Project
	Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)			94:1852	FEMP-2322
	94:1837	DOE/OR-01-1109		94:2029	FEMP-2314
	94:2998	ES/ER/TM-113		94:2032	FEMP-2324
	94:3002	ES/ESH-50		94:2034	FEMP-2330
	94:3003	ES/ESH-51		94:2035	FEMP-2342
	94:3004	ES/ESH-53		94:2036	FEMP-2354
	94:3005	ES/ESH-54		94:2475	FEMP-2303
	Ebasco Services, Inc., Oak Ridge, TN (United States)			94:3007	FEMP-2353
	94:2056	ORNL/ER-216			Fernald Environmental Restoration Man- agement Corp., Cincinnati, OH (United States)
	Oak Ridge K-25 Site, TN (United States)			94:1853	FEMP-2323
	94:531	DOE/MWIP-17		94:2030	FEMP-2318
	94:532	DOE/MWIP-18		94:2033	FEMP-2326
	94:632	K/TCD-1111		94:2037	FEMP/SUB-084
	94:662	ORNL/M-2751/V1/Pt.B			Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States)
	94:663	ORNL/M-2751/V3/Pt.A		94:2031	FEMP-2320
	94:664	ORNL/M-2751/V3/Pt.B	AC05-93OR22028		Jacobs Engineering Group, Inc., Oak Ridge, TN (United States)
	94:665	ORNL/M-2751/V3/Pt.C		94:1966	DOE/OR/22028-T15
	94:2292	Y/ER-159/V3/Pt.A	AC05-93OR22160		IIT Research Inst., Chicago, IL (United States)
	94:2293	Y/ER-159/V3/Pt.B		94:67	DOE/OR/22160-T10
	Oak Ridge National Lab., TN (United States). Environmental Restoration Div.			94:68	DOE/OR/22160-T12
	94:136	ORNL/ER-237		94:69	DOE/OR/22160-T14
	94:656	ORNL/ER-57		94:70	DOE/OR/22160-T15
	Oak Ridge National Lab., Grand Junc- tion, CO (United States)			94:71	DOE/OR/22160-T16
	94:41	CONF-9408110-1	AC06-76RL01830		Oak Ridge National Lab., TN (United States)
	Bechtel Environmental, Inc., Oak Ridge, TN (United States)			94:2067	ORNL/TM-12817
	94:1919	CAPE-3085		94:2069	ORNL/TM-12817
	Senes Oak Ridge, Inc., TN (United States)				Battelle Pacific Northwest Lab., Richland, WA (United States)
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	94:368	Journal article		94:3028	PNL-9823
	94:379	Journal article		94:3029	PNL-9824
	94:380	Journal article		94:3039	PNL-SA-24157
	94:381	Journal article			Westinghouse Hanford Co., Richland, WA (United States)
	94:385	Journal article		94:299	WHC-SD-EN-TRP-007
	94:906	Journal article			Pacific Northwest Lab., Richland, WA (United States)
	94:907	Journal article		94:16	PNL-10400-Draft
	94:908	Journal article		94:50	DOE/EM-0201
	94:911	Journal article		94:154	PNL-9335
	94:2894	Journal article		94:155	PNL-9411
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	94:538	DOE/OR-01-1161/V1- D2/A1		94:158	PNL-9791
	94:676	ORNL/TM-12908		94:159	PNL-9986
	94:2070	ORNL/TM-12900		94:160	PNL-10060
	94:2291	Y/ER-159/V1		94:161	PNL-10079
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	94:2290	Y/ER-158		94:163	PNL-10082
AC05-84OT21400	Oak Ridge National Lab., TN (United States)			94:164	PNL-10094
	94:530	DOE/MWIP-16		94:165	PNL-10109
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	94:168	PNL-10123		94:693	PNL-SA-24093
	94:169	PNL-10158		94:694	PNL-SA-24289
	94:170	PNL-10166		94:695	PNL-SA-24418
	94:171	PNL-10170		94:696	PNL-SA-24672
	94:172	PNL-10170-Reissue		94:697	PNL-SA-24694
	94:173	PNL-10171		94:698	PNL-SA-24698
	94:174	PNL-10182		94:699	PNL-SA-25362
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	94:176	PNL-10194		94:958	PNL-8901
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	94:178	PNL-10208		94:960	PNL-9409
	94:179	PNL-10209		94:961	PNL-9434-Rev.1
	94:180	PNL-10240		94:962	PNL-9446
	94:181	PNL-10275		94:963	PNL-9814
	94:182	PNL-10285		94:964	PNL-9814-Rev.1
	94:183	PNL-10379		94:965	PNL-9814-Rev.2
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	94:193	PNL-SA-23775		94:975	PNL-10095
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	94:197	PNL-SA-24002		94:980	PNL-10107
	94:199	PNL-SA-24087		94:981	PNL-10127
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	94:201	PNL-SA-24120		94:983	PNL-10130
	94:202	PNL-SA-24123		94:984	PNL-10134
	94:203	PNL-SA-24159		94:985	PNL-10138
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	94:215	PNL-SA-24564		94:997	PNL-10198
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	94:222	PNL-SA-25864		94:1004	PNL-SA-22937
	94:463	DOE/EM-0089T-Rev.2		94:1005	PNL-SA-23112
	94:575	DOE/RL-94-55-Rev.1		94:1006	PNL-SA-23790
	94:678	PNL-8955		94:1007	PNL-SA-23850
	94:679	PNL-9744		94:1008	PNL-SA-23865
	94:680	PNL-9746		94:1009	PNL-SA-23952
	94:681	PNL-10098		94:1010	PNL-SA-24027
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	94:685	PNL-10476		94:1014	PNL-SA-24498
	94:686	PNL-SA-23055		94:1015	PNL-SA-24741
	94:687	PNL-SA-23411		94:1016	PNL-SA-24849
	94:688	PNL-SA-23466		94:1017	PNL-SA-24951
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	94:1873	PNL-SA-24508		94:2926	PNL-SA-23598
	94:1874	PNL-SA-24683		94:2927	PNL-SA-24320
	94:1875	PNL-SA-24752		94:2928	PNL-SA-24451
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	94:2334	PNL-SA-22987		94:3043	PNL-SA-24743
	94:2335	PNL-SA-23330		94:3044	PNL-SA-24754
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	94:2546	PNL-SA-23454		94:258	WHC-SA-2268
	94:2547	PNL-SA-23487		94:259	WHC-SA-2358
	94:2548	PNL-SA-23488		94:260	WHC-SA-2377
	94:2549	PNL-SA-23718		94:261	WHC-SA-2481
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	94:2555	PNL-SA-24144		94:267	WHC-SD-C018-RPT-003
	94:2556	PNL-SA-24319		94:268	WHC-SD-EN-AP-151-Rev.1
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	94:274	WHC-SD-EN-DP-082		94:721	WHC-EP-0527-3
	94:275	WHC-SD-EN-DP-089		94:722	WHC-EP-0802
	94:276	WHC-SD-EN-DP-090		94:723	WHC-EP-0803
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	94:278	WHC-SD-EN-PMP-008		94:725	WHC-EP-0845
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	94:302	WHC-SD-ETF-PCP-001		94:749	WHC-SD-EN-EV-030
	94:303	WHC-SD-ETF-PLN-002		94:750	WHC-SD-EN-QAPP-003- Rev.2
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	94:305	WHC-SD-SNF-ATP-004		94:752	WHC-SD-EN-RPT-009
	94:306	WHC-SD-SNF-ATP-005		94:753	WHC-SD-EN-TI-203
	94:307	WHC-SD-SNF-ER-005		94:754	WHC-SD-EN-TI-220
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	94:311	WHC-SD-SNF-TI-006		94:758	WHC-SD-EN-TI-245
	94:312	WHC-SD-W049H-ATR-001		94:759	WHC-SD-EN-TI-265
	94:313	WHC-SD-W049H-ATP-001		94:761	WHC-SD-EN-TI-282
	94:314	WHC-SD-W049H-ATP-002		94:762	WHC-SD-EN-TI-290
	94:315	WHC-SD-W049H-ATP-003		94:763	WHC-SD-EN-TI-292
	94:316	WHC-SD-W049H-ATR-002		94:764	WHC-SD-EN-TP-048
	94:317	WHC-SD-W049H-ATR-003		94:765	WHC-SD-EN-TP-049
	94:318	WHC-SD-W049H-CSRS- 001		94:766	WHC-SD-ER-TC-001
	94:319	WHC-SD-W049H-ICD- 001-Rev.1		94:767	WHC-SD-ETF-WAC-001
	94:320	WHC-SD-W049H-RRR- 001		94:768	WHC-SD-HWV-PLN-002- Rev.5
	94:321	WHC-SD-W105-OTR-003		94:769	WHC-SD-L045H-CSCM- 001
	94:323	WHC-SD-W252-FDC-001- Rev.1		94:770	WHC-SD-L045H-CSDD- 001
	94:324	WHC-SD-WM-DP-075		94:771	WHC-SD-L045H-CSWD- 002
	94:325	WHC-SD-WM-ER-333		94:772	WHC-SD-L045H-ER-003
	94:326	WHC-SD-WM-MAR-003		94:773	WHC-SD-L045H-OTR-001
	94:327	WHC-SD-WM-OTP-171		94:774	WHC-SD-L045H-PC-001
	94:328	WHC-SD-WM-PLN-096		94:775	WHC-SD-L045H-PLN-004
	94:329	WHC-SD-WM-TP-163		94:776	WHC-SD-L045H-RPT-001
	94:330	WHC-SD-WM-TP-164		94:777	WHC-SD-L045H-RRR- 001-Rev.1
	94:331	WHC-SD-WM-TP-165		94:778	WHC-SD-L045H-SM-001
	94:332	WHC-SP-1097		94:779	WHC-SD-L045H-SM-001- Rev.1
	94:333	WHC-SP-1124		94:780	WHC-SD-L045H-TI-005
	94:559	DOE/RL-89-28-Rev.2		94:781	WHC-SD-L070-PMP-001
	94:560	DOE/RL-90-12-Rev.2			

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	94:783	WHC-SD-LEF-CSCM-001		94:839	WHC-SD-W378-ES-001
	94:784	WHC-SD-LEF-OTR-001		94:840	WHC-SD-W378-SP-001
	94:785	WHC-SD-LEF-PLN-001		94:841	WHC-SD-WM-AP-029
	94:786	WHC-SD-LEF-PLN-002		94:842	WHC-SD-WM-AP-033
	94:787	WHC-SD-LEF-QAPP-001		94:843	WHC-SD-WM-DTR-030
	94:788	WHC-SD-LEF-QAPP-002		94:844	WHC-SD-WM-EV-096
	94:789	WHC-SD-LEF-TS-001		94:845	WHC-SD-WM-FHA-006
	94:790	WHC-SD-LEF-TS-001- Rev.1		94:846	WHC-SD-WM-ML-001
	94:791	WHC-SD-LEF-TS-001- Rev.2		94:847	WHC-SD-WM-PICD-001
	94:792	WHC-SD-SNF-ES-005		94:848	WHC-SD-WM-PLN-071
	94:793	WHC-SD-SNF-HC-002		94:849	WHC-SD-WM-PLN-090
	94:794	WHC-SD-SQA-CSWD- 30016		94:850	WHC-SD-WM-PROC-014
	94:795	WHC-SD-TP-RPT-014		94:851	WHC-SD-WM-RA-010
	94:796	WHC-SD-W007H-ATP-001		94:852	WHC-SD-WM-RD-052
	94:798	WHC-SD-W007H-ATR-001		94:853	WHC-SD-WM-RPT-060
	94:799	WHC-SD-W007H-ATR-002		94:854	WHC-SD-WM-RPT-099
	94:800	WHC-SD-W007H-FDC- 001-Rev.3		94:855	WHC-SD-WM-RPT-099- Rev.1
	94:801	WHC-SD-W007H-OTP- 001		94:856	WHC-SD-WM-SAD-025- Rev.2
	94:802	WHC-SD-W025-ATP-002		94:857	WHC-SD-WM-SARR-028
	94:803	WHC-SD-W025-ATR-002		94:858	WHC-SD-WM-SEL-012- Rev.4
	94:804	WHC-SD-W025-EMS-002		94:859	WHC-SD-WM-SEL-036
	94:805	WHC-SD-W025-EMS-002- Rev.1		94:860	WHC-SD-WM-TI-399- Rev.2
	94:806	WHC-SD-W025-FDR-001- Rev.1-Vol.1-2		94:861	WHC-SD-WM-TI-404- Rev.3
	94:807	WHC-SD-W025-PLN-002		94:862	WHC-SD-WM-TI-624
	94:808	WHC-SD-W025-RPT-001		94:863	WHC-SD-WM-TI-686
	94:809	WHC-SD-W025-RPT-002		94:864	WHC-SD-WM-TRP-220
	94:810	WHC-SD-W025-RPT-003		94:865	WHC-SD-WM-VI-011
	94:811	WHC-SD-W025-VI-001		94:866	WHC-SD-WM-VI-014
	94:812	WHC-SD-W025-VI-001- Rev.1		94:867	WHC-SD-WM-VI-015
	94:813	WHC-SD-W026-PLN-004		94:868	WHC-SD-WM-WP-245- Rev.1
	94:814	WHC-SD-W026-PLN-005		94:869	WHC-SP-0665-14
	94:815	WHC-SD-W026-PLN-006		94:870	WHC-SP-0665-15
	94:816	WHC-SD-W026-QAPP- 001-Rev.1		94:871	WHC-SP-0992-1
	94:817	WHC-SD-W026-TC-002		94:872	WHC-SP-1009-Rev.1
	94:818	WHC-SD-W026-TP-001		94:1019	SD-WM-TI-230-Rev.2
	94:819	WHC-SD-W026-TP-008		94:1024	WHC-EP-0182-71
	94:820	WHC-SD-W100-AP-002		94:1025	WHC-EP-0182-74
	94:821	WHC-SD-W100-DTR-003		94:1026	WHC-EP-0407-Rev.2
	94:822	WHC-SD-W100-ES-009		94:1027	WHC-EP-0431-Rev.1
	94:823	WHC-SD-W100-RD-001- Rev.1		94:1028	WHC-EP-0473-Rev.1
	94:824	WHC-SD-W100-SDRD- 001		94:1029	WHC-EP-0473-Rev.2
	94:825	WHC-SD-W100-TC-001		94:1030	WHC-EP-0474-10
	94:826	WHC-SD-W100-TD-001		94:1031	WHC-EP-0474-13
	94:827	WHC-SD-W100-TP-011		94:1032	WHC-EP-0474-14
	94:828	WHC-SD-W100-TP-014		94:1033	WHC-EP-0474-15
	94:829	WHC-SD-W112-CSER- 001		94:1034	WHC-EP-0532-Rev.2
	94:830	WHC-SD-W112-ES-006		94:1035	WHC-EP-0562-Rev.1
	94:831	WHC-SD-W112-SDRD- 001		94:1036	WHC-EP-0579
	94:832	WHC-SD-W113-SDRD- 001		94:1037	WHC-EP-0711
	94:833	WHC-SD-W242-ES-003		94:1038	WHC-EP-0729
	94:834	WHC-SD-W306-SDRD- 001		94:1039	WHC-EP-0733-Rev.1
	94:835	WHC-SD-W306-TI-003		94:1040	WHC-EP-0739
	94:836	WHC-SD-W364-PMP-001		94:1041	WHC-EP-0743
	94:837	WHC-SD-W370-ER-001		94:1042	WHC-EP-0750-Vol.1-Rev.1
				94:1043	WHC-EP-0750-Vol.2-Rev.1
				94:1044	WHC-EP-0750-Vol.3-Rev.1
				94:1045	WHC-EP-0750-Vol.4-Rev.1
				94:1046	WHC-EP-0750-Vol.5- Rev.1-2
				94:1047	WHC-EP-0750-Vol.6-Rev.1
				94:1048	WHC-EP-0750-Vol.7-Rev.1
				94:1049	WHC-EP-0756
				94:1050	WHC-EP-0758
				94:1051	WHC-EP-0772

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	94:1053	WHC-EP-0780		94:1119	WHC-SD-SQA-TA-20011-Rev.2
	94:1054	WHC-EP-0782-Vol.1		94:1120	WHC-SD-TD-RPT-010
	94:1055	WHC-EP-0782-Vol.2		94:1121	WHC-SD-TD-RPT-011
	94:1056	WHC-EP-0784		94:1122	WHC-SD-TD-RPT-012
	94:1057	WHC-EP-0785		94:1123	WHC-SD-TD-WP-0050
	94:1058	WHC-EP-0786		94:1124	WHC-SD-TP-SEP-024
	94:1059	WHC-EP-0791		94:1125	WHC-SD-TP-SEP-026
	94:1060	WHC-EP-0793		94:1126	WHC-SD-W058-FDC-001-Rev.2
	94:1061	WHC-EP-0794		94:1127	WHC-SD-W058-WP-001
	94:1062	WHC-EP-0796		94:1128	WHC-SD-W151-ANAL-001
	94:1063	WHC-EP-0800		94:1129	WHC-SD-W151-ATP-001-Rev.1
	94:1064	WHC-EP-0805		94:1130	WHC-SD-W151-ATP-002
	94:1065	WHC-EP-0806		94:1131	WHC-SD-W151-ETP-001
	94:1066	WHC-EP-0807		94:1132	WHC-SD-W151-QAPP-001-Rev.2
	94:1067	WHC-EP-0809		94:1133	WHC-SD-W151-TI-002
	94:1068	WHC-EP-0816		94:1134	WHC-SD-W151-WP-005
	94:1069	WHC-EP-0831		94:1135	WHC-SD-W178-PMP-001
	94:1070	WHC-EP-0839		94:1136	WHC-SD-W178-QAPP-001
	94:1071	WHC-EP-0847		94:1137	WHC-SD-W211-TDR-001
	94:1072	WHC-MR-0455		94:1138	WHC-SD-W211-TI-002
	94:1073	WHC-MR-0483		94:1139	WHC-SD-W236A-ER-008
	94:1074	WHC-MR-0492		94:1140	WHC-SD-W236A-ER-010
	94:1075	WHC-SA-1196-Rev.1		94:1141	WHC-SD-W236A-ER-011
	94:1076	WHC-SA-1601		94:1142	WHC-SD-W236A-ER-014
	94:1077	WHC-SA-1884		94:1143	WHC-SD-W236A-ER-015
	94:1078	WHC-SA-2016		94:1144	WHC-SD-W236A-ES-003
	94:1079	WHC-SA-2305		94:1145	WHC-SD-W236A-ES-005
	94:1080	WHC-SA-2335		94:1146	WHC-SD-W236A-ES-011
	94:1081	WHC-SA-2347		94:1147	WHC-SD-W236A-MP-001-Rev.1
	94:1082	WHC-SA-2407		94:1148	WHC-SD-W236A-PLN-002
	94:1083	WHC-SA-2447		94:1149	WHC-SD-W236A-PLN-006-Rev.2
	94:1084	WHC-SA-2449		94:1150	WHC-SD-W236A-RPT-004
	94:1085	WHC-SA-2478		94:1151	WHC-SD-W236A-SDRD-001-Rev.1
	94:1086	WHC-SA-2504		94:1152	WHC-SD-W236A-TI-004
	94:1087	WHC-SA-2539		94:1153	WHC-SD-W236A-TI-005
	94:1088	WHC-SA-2540		94:1154	WHC-SD-W236A-TI-006
	94:1089	WHC-SA-2544		94:1155	WHC-SD-W236A-TI-007
	94:1090	WHC-SA-2549		94:1156	WHC-SD-W236A-TI-008
	94:1091	WHC-SA-2562		94:1157	WHC-SD-W236A-TI-009
	94:1092	WHC-SA-2563		94:1158	WHC-SD-W236A-TI-010
	94:1093	WHC-SA-2565		94:1159	WHC-SD-W236A-TI-010-Rev.1
	94:1094	WHC-SA-2584		94:1160	WHC-SD-W236A-TI-011
	94:1095	WHC-SA-2595		94:1161	WHC-SD-W236A-TI-013
	94:1096	WHC-SA-2613		94:1162	WHC-SD-W236A-TI-014
	94:1097	WHC-SA-2617		94:1163	WHC-SD-W236A-TI-016
	94:1098	WHC-SA-2618		94:1164	WHC-SD-W236A-TR-001-Rev.1
	94:1099	WHC-SA-2639		94:1165	WHC-SD-W236A-WP-002
	94:1100	WHC-SA-2651		94:1166	WHC-SD-W236B-DRD-001
	94:1101	WHC-SA-2669		94:1167	WHC-SD-W236B-EV-001-Rev.2
	94:1102	WHC-SA-2690		94:1168	WHC-SD-W236B-FRD-001
	94:1103	WHC-SA-2696		94:1169	WHC-SD-W236B-FRD-002-Rev.1
	94:1104	WHC-SA-2804		94:1170	WHC-SD-W236B-SOW-001
	94:1105	WHC-SD-610-ATP-002		94:1171	WHC-SD-W236B-TI-006
	94:1106	WHC-SD-CP-OTR-151		94:1172	WHC-SD-W280-ATP-001
	94:1107	WHC-SD-EN-ES-040			
	94:1108	WHC-SD-EN-RD-010			
	94:1109	WHC-SD-EN-TI-223			
	94:1110	WHC-SD-ER3297-TS-001-Rev.1			
	94:1111	WHC-SD-ER3297-TS-001-Rev.2			
	94:1112	WHC-SD-ER3641-ATP-002-Rev.2			
	94:1113	WHC-SD-ER3641-OTP-001-Rev.1			
	94:1114	WHC-SD-ER3641-OTP-004-Rev.1			
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	94:1116	WHC-SD-SQA-CSA-20368			
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	94:1174	WHC-SD-W314B-DA-002		94:1224	WHC-SD-WM-ATP-080
	94:1175	WHC-SD-W314-FRD-001		94:1225	WHC-SD-WM-ATP-082
	94:1176	WHC-SD-W314-PLN-001		94:1226	WHC-SD-WM-ATP-092
	94:1177	WHC-SD-W320-ANAL-002		94:1227	WHC-SD-WM-ATP-093
	94:1178	WHC-SD-W320-ANAL-003		94:1228	WHC-SD-WM-ATP-096
	94:1179	WHC-SD-W320-CBA-001		94:1229	WHC-SD-WM-ATP-098
	94:1180	WHC-SD-W320-DA-001		94:1230	WHC-SD-WM-ATP-100
	94:1181	WHC-SD-W320-DA-004		94:1231	WHC-SD-WM-ATP-106
	94:1182	WHC-SD-W320-DA-005		94:1232	WHC-SD-WM-ATP-107
	94:1183	WHC-SD-W320-DA-006		94:1233	WHC-SD-WM-ATP-107- Rev.1
	94:1184	WHC-SD-W320-PMP-001- Rev.2		94:1234	WHC-SD-WM-ATP-112
	94:1185	WHC-SD-W320-PMP-001- Rev.3		94:1235	WHC-SD-WM-ATP-113
	94:1186	WHC-SD-W320-QAPP- 001-Rev.1		94:1236	WHC-SD-WM-ATP-119
	94:1187	WHC-SD-W320-TC-002		94:1237	WHC-SD-WM-ATP-122
	94:1188	WHC-SD-W320-TIS-001		94:1238	WHC-SD-WM-ATP-124
	94:1189	WHC-SD-W320-TIS-001- Rev.1		94:1239	WHC-SD-WM-ATP-127
	94:1190	WHC-SD-W320-TIS-001- Rev.2		94:1240	WHC-SD-WM-ATR-044
	94:1191	WHC-SD-W320-TIS-001- Rev.3		94:1241	WHC-SD-WM-ATR-057
	94:1192	WHC-SD-W320-TRP-001		94:1242	WHC-SD-WM-ATR-066
	94:1193	WHC-SD-W320-TRP-002		94:1243	WHC-SD-WM-ATR-069- Rev.1
	94:1194	WHC-SD-W340-ECOR- 001		94:1244	WHC-SD-WM-ATR-078
	94:1195	WHC-SD-W340-ES-002		94:1245	WHC-SD-WM-ATR-081
	94:1196	WHC-SD-W340-SEL-002		94:1246	WHC-SD-WM-ATR-082
	94:1197	WHC-SD-W340-WP-002		94:1247	WHC-SD-WM-ATR-084
	94:1198	WHC-SD-W402-CR-001- Rev.1		94:1248	WHC-SD-WM-ATR-088
	94:1199	WHC-SD-W402-CR-001- Rev.2		94:1249	WHC-SD-WM-ATR-094
	94:1200	WHC-SD-W402-FHA-001		94:1250	WHC-SD-WM-ATR-098
	94:1201	WHC-SD-W413-FHA-001		94:1251	WHC-SD-WM-ATR-103
	94:1202	WHC-SD-WM-ABU-001		94:1252	WHC-SD-WM-ATR-112
	94:1203	WHC-SD-WM-ANAL-014		94:1253	WHC-SD-WM-CGA-001
	94:1204	WHC-SD-WM-ANAL-018		94:1254	WHC-SD-WM-CM-008
	94:1205	WHC-SD-WM-ANAL-020- Rev.1		94:1255	WHC-SD-WM-CM-011
	94:1206	WHC-SD-WM-ANAL-029		94:1256	WHC-SD-WM-CMD-001
	94:1208	WHC-SD-WM-ANAL-033- Vol.2		94:1257	WHC-SD-WM-CMD-002
	94:1209	WHC-SD-WM-ANAL-034- Vol.1		94:1258	WHC-SD-WM-CMD-003
	94:1210	WHC-SD-WM-ANAL-034- Vol.2		94:1259	WHC-SD-WM-CMD-004
	94:1211	WHC-SD-WM-ANAL-035- Vol.1		94:1260	WHC-SD-WM-CR-057
	94:1212	WHC-SD-WM-ANAL-035- Vol.2		94:1261	WHC-SD-WM-CSCM-027
	94:1213	WHC-SD-WM-ANAL-036		94:1262	WHC-SD-WM-CSDD-004
	94:1214	WHC-SD-WM-ANAL-043		94:1263	WHC-SD-WM-CSDD-008- Rev.1
	94:1215	WHC-SD-WM-AP-005- Rev.5		94:1264	WHC-SD-WM-CSDD-014
	94:1216	WHC-SD-WM-AP-019- Rev.1		94:1265	WHC-SD-WM-CSDD-015
	94:1217	WHC-SD-WM-AP-031		94:1266	WHC-SD-WM-CSRS-016
	94:1218	WHC-SD-WM-AP-035		94:1267	WHC-SD-WM-CSWD-067
	94:1219	WHC-SD-WM-ATP-023- Rev.5		94:1268	WHC-SD-WM-CSWD-069
	94:1221	WHC-SD-WM-ATP-063- Rev.1		94:1269	WHC-SD-WM-CSWL-002- Rev.2
	94:1222	WHC-SD-WM-ATP-069- Rev.2		94:1270	WHC-SD-WM-DA-144
				94:1271	WHC-SD-WM-DA-157
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				94:1274	WHC-SD-WM-DA-160
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				94:1284	WHC-SD-WM-DA-173
				94:1285	WHC-SD-WM-DA-179
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	94:1292	WHC-SD-WM-DLP-006		94:1365	WHC-SD-WM-ER-386
	94:1293	WHC-SD-WM-DP-065		94:1366	WHC-SD-WM-ER-387
	94:1294	WHC-SD-WM-DP-065- Add.1A		94:1367	WHC-SD-WM-ER-390
	94:1295	WHC-SD-WM-DP-067		94:1368	WHC-SD-WM-ER-391
	94:1296	WHC-SD-WM-DP-069		94:1369	WHC-SD-WM-ER-392
	94:1297	WHC-SD-WM-DP-071		94:1370	WHC-SD-WM-ER-393
	94:1298	WHC-SD-WM-DP-072		94:1371	WHC-SD-WM-ER-394
	94:1299	WHC-SD-WM-DP-073		94:1372	WHC-SD-WM-ER-395
	94:1300	WHC-SD-WM-DP-0076		94:1373	WHC-SD-WM-ER-397
	94:1301	WHC-SD-WM-DP-077		94:1374	WHC-SD-WM-ER-399
	94:1302	WHC-SD-WM-DP-078		94:1375	WHC-SD-WM-ER-399- Rev.
	94:1303	WHC-SD-WM-DP-079		94:1376	WHC-SD-WM-ER-402
	94:1304	WHC-SD-WM-DP-080		94:1377	WHC-SD-WM-ER-415
	94:1305	WHC-SD-WM-DP-081		94:1378	WHC-SD-WM-ER-417
	94:1306	WHC-SD-WM-DP-082		94:1379	WHC-SD-WM-ER-431
	94:1307	WHC-SD-WM-DP-088		94:1380	WHC-SD-WM-ES-185
	94:1308	WHC-SD-WM-DP-089		94:1381	WHC-SD-WM-ES-290
	94:1309	WHC-SD-WM-DP-096		94:1382	WHC-SD-WM-ES-290- Rev.2
	94:1310	WHC-SD-WM-DP-097		94:1383	WHC-SD-WM-ES-299
	94:1311	WHC-SD-WM-DP-098		94:1384	WHC-SD-WM-ES-300
	94:1312	WHC-SD-WM-DP-099		94:1385	WHC-SD-WM-ES-300- Rev.1
	94:1313	WHC-SD-WM-DP-100		94:1386	WHC-SD-WM-ES-303
	94:1314	WHC-SD-WM-DP-101		94:1387	WHC-SD-WM-ES-310
	94:1315	WHC-SD-WM-DP-102		94:1388	WHC-SD-WM-ES-311
	94:1316	WHC-SD-WM-DP-129		94:1389	WHC-SD-WM-ES-312
	94:1317	WHC-SD-WM-DQO-007		94:1390	WHC-SD-WM-ES-314
	94:1318	WHC-SD-WM-DQO-011- Rev.1		94:1391	WHC-SD-WM-ES-316
	94:1319	WHC-SD-WM-DQO-014		94:1392	WHC-SD-WM-ES-318
	94:1320	WHC-SD-WM-DRR-047		94:1393	WHC-SD-WM-ES-320
	94:1321	WHC-SD-WM-DTP-033		94:1394	WHC-SD-WM-ES-328
	94:1322	WHC-SD-WM-DTR-025		94:1395	WHC-SD-WM-ES-330
	94:1323	WHC-SD-WM-DTR-034		94:1396	WHC-SD-WM-ES-334
	94:1324	WHC-SD-WM-DTR-036		94:1397	WHC-SD-WM-ES-335
	94:1325	WHC-SD-WM-EE-004- Rev.1		94:1398	WHC-SD-WM-ES-336
	94:1326	WHC-SD-WM-EL-003		94:1399	WHC-SD-WM-ES-340
	94:1327	WHC-SD-WM-EMP-032		94:1400	WHC-SD-WM-ES-349
	94:1328	WHC-SD-WM-ER-029- Rev.20		94:1401	WHC-SD-WM-ETP-058
	94:1330	WHC-SD-WM-ER-309		94:1402	WHC-SD-WM-ETP-0106
	94:1332	WHC-SD-WM-ER-311		94:1403	WHC-SD-WM-ETP-107
	94:1334	WHC-SD-WM-ER-313		94:1404	WHC-SD-WM-ETP-113
	94:1336	WHC-SD-WM-ER-324		94:1405	WHC-SD-WM-ETP-115
	94:1337	WHC-SD-WM-ER-325		94:1406	WHC-SD-WM-ETP-118
	94:1338	WHC-SD-WM-ER-332		94:1407	WHC-SD-WM-ETP-119
	94:1339	WHC-SD-WM-ER-343		94:1408	WHC-SD-WM-ETP-122
	94:1340	WHC-SD-WM-ER-347		94:1409	WHC-SD-WM-ETP-125
	94:1341	WHC-SD-WM-ER-349		94:1410	WHC-SD-WM-ETP-128
	94:1343	WHC-SD-WM-ER-352		94:1411	WHC-SD-WM-ETP-129
	94:1344	WHC-SD-WM-ER-358		94:1412	WHC-SD-WM-ETP-135
	94:1345	WHC-SD-WM-ER-359		94:1413	WHC-SD-WM-ETP-137
	94:1346	WHC-SD-WM-ER-360		94:1414	WHC-SD-WM-ETP-138
	94:1347	WHC-SD-WM-ER-361		94:1415	WHC-SD-WM-ETP-143
	94:1348	WHC-SD-WM-ER-362		94:1416	WHC-SD-WM-ETP-146
	94:1349	WHC-SD-WM-ER-363		94:1417	WHC-SD-WM-ETP-148
	94:1350	WHC-SD-WM-ER-364		94:1418	WHC-SD-WM-ETP-150
	94:1351	WHC-SD-WM-ER-365		94:1419	WHC-SD-WM-EV-053- Rev.2
	94:1352	WHC-SD-WM-ER-367		94:1420	WHC-SD-WM-EV-098
	94:1353	WHC-SD-WM-ER-368		94:1421	WHC-SD-WM-FDC-031
	94:1354	WHC-SD-WM-ER-369		94:1422	WHC-SD-WM-FDC-032
	94:1355	WHC-SD-WM-ER-370		94:1423	WHC-SD-WM-FDC-036
	94:1356	WHC-SD-WM-ER-372		94:1424	WHC-SD-WM-FDC-036- Rev.1
	94:1357	WHC-SD-WM-ER-373		94:1425	WHC-SD-WM-FDC-041
	94:1358	WHC-SD-WM-ER-375		94:1426	WHC-SD-WM-FDC-042
	94:1359	WHC-SD-WM-ER-377		94:1427	WHC-SD-WM-FHA-005
	94:1361	WHC-SD-WM-ER-380		94:1428	WHC-SD-WM-FRD-019
	94:1362	WHC-SD-WM-ER-381			

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	94:1429	WHC-SD-WM-HC-014		94:1491	WHC-SD-WM-SDD-054
	94:1430	WHC-SD-WM-HIE-003		94:1492	WHC-SD-WM-SDD-055
	94:1431	WHC-SD-WM-HSP-002- Rev.2		94:1493	WHC-SD-WM-SDRR-001
	94:1432	WHC-SD-WM-LL-006		94:1494	WHC-SD-WM-SEL-033- Rev.1
	94:1433	WHC-SD-WM-MAR-001		94:1495	WHC-SD-WM-SOIL-001
	94:1434	WHC-SD-WM-OMM-015		94:1496	WHC-SD-WM-SP-001
	94:1435	WHC-SD-WM-OMM-016		94:1497	WHC-SD-WM-SP-006
	94:1436	WHC-SD-WM-OTP-151		94:1498	WHC-SD-WM-SSP-005
	94:1437	WHC-SD-WM-OTP-158		94:1499	WHC-SD-WM-TA-154
	94:1438	WHC-SD-WM-OTP-159		94:1500	WHC-SD-WM-TA-156
	94:1439	WHC-SD-WM-OTP-161		94:1501	WHC-SD-WM-TA-157
	94:1440	WHC-SD-WM-OTP-163		94:1502	WHC-SD-WM-TA-158
	94:1441	WHC-SD-WM-OTP-164		94:1503	WHC-SD-WM-TA-159
	94:1442	WHC-SD-WM-OTP-165		94:1504	WHC-SD-WM-TA-160
	94:1443	WHC-SD-WM-OTP-167		94:1505	WHC-SD-WM-TC-005
	94:1444	WHC-SD-WM-OTP-168		94:1506	WHC-SD-WM-TC-062
	94:1445	WHC-SD-WM-OTR-148		94:1507	WHC-SD-WM-TC-066
	94:1446	WHC-SD-WM-OTR-151		94:1508	WHC-SD-WM-TI-363
	94:1447	WHC-SD-WM-OTR-153		94:1509	WHC-SD-WM-TI-386
	94:1448	WHC-SD-WM-OTR-155		94:1510	WHC-SD-WM-TI-540
	94:1449	WHC-SD-WM-PAP-60		94:1511	WHC-SD-WM-TI-540- Rev.1
	94:1450	WHC-SD-WM-PC-002- Rev.6		94:1512	WHC-SD-WM-TI-573- Rev.1
	94:1451	WHC-SD-WM-PCP-009		94:1513	WHC-SD-WM-TI-577- Rev.1
	94:1452	WHC-SD-WM-PE-053		94:1514	WHC-SD-WM-TI-591
	94:1453	WHC-SD-WM-PE-054		94:1515	WHC-SD-WM-TI-594- Rev.1
	94:1454	WHC-SD-WM-PLN-072- Rev.1		94:1516	WHC-SD-WM-TI-623
	94:1455	WHC-SD-WM-PLN-076		94:1517	WHC-SD-WM-TI-633
	94:1456	WHC-SD-WM-PLN-081- Rev.3		94:1518	WHC-SD-WM-TI-634- Rev.1
	94:1457	WHC-SD-WM-PLN-091		94:1519	WHC-SD-WM-TI-638
	94:1459	WHC-SD-WM-PROC-018		94:1520	WHC-SD-WM-TI-645
	94:1460	WHC-SD-WM-PROC-019		94:1521	WHC-SD-WM-TI-646
	94:1461	WHC-SD-WM-PSE-010		94:1522	WHC-SD-WM-TI-648
	94:1462	WHC-SD-WM-PTR-013		94:1523	WHC-SD-WM-TI-650
	94:1463	WHC-SD-WM-QAPP-009- Rev.1		94:1524	WHC-SD-WM-TI-651
	94:1464	WHC-SD-WM-QAPP-018- Rev.1		94:1525	WHC-SD-WM-TI-652
	94:1465	WHC-SD-WM-QAPP-029		94:1526	WHC-SD-WM-TI-653
	94:1466	WHC-SD-WM-QAPP-030		94:1527	WHC-SD-WM-TI-656
	94:1467	WHC-SD-WM-RD-038- Rev.1		94:1528	WHC-SD-WM-TI-656- Rev.1
	94:1468	WHC-SD-WM-RD-049		94:1529	WHC-SD-WM-TI-657
	94:1469	WHC-SD-WM-RD-053		94:1530	WHC-SD-WM-TI-658
	94:1470	WHC-SD-WM-RPT-087		94:1531	WHC-SD-WM-TI-661
	94:1471	WHC-SD-WM-RPT-093		94:1532	WHC-SD-WM-TI-664
	94:1472	WHC-SD-WM-RPT-098		94:1533	WHC-SD-WM-TI-665
	94:1473	WHC-SD-WM-RPT-102		94:1534	WHC-SD-WM-TI-666
	94:1474	WHC-SD-WM-RPT-104		94:1535	WHC-SD-WM-TI-667
	94:1475	WHC-SD-WM-RPT-105		94:1536	WHC-SD-WM-TI-668
	94:1476	WHC-SD-WM-RPT-107		94:1537	WHC-SD-WM-TI-674
	94:1477	WHC-SD-WM-RPT-137		94:1538	WHC-SD-WM-TI-677
	94:1478	WHC-SD-WM-SAD-016- Rev.2		94:1539	WHC-SD-WM-TI-682
	94:1479	WHC-SD-WM-SAR-064		94:1540	WHC-SD-WM-TI-692
	94:1480	WHC-SD-WM-SARR-012- Rev.1		94:1541	WHC-SD-WM-TI-693
	94:1481	WHC-SD-WM-SARR-031		94:1542	WHC-SD-WM-TP-147
	94:1482	WHC-SD-WM-SARR-034		94:1543	WHC-SD-WM-TP-180
	94:1483	WHC-SD-WM-SD-019		94:1544	WHC-SD-WM-TP-193
	94:1484	WHC-SD-WM-SDD-024		94:1545	WHC-SD-WM-TP-200
	94:1485	WHC-SD-WM-SDD-025		94:1546	WHC-SD-WM-TP-206
	94:1486	WHC-SD-WM-SDD-027		94:1547	WHC-SD-WM-TP-207
	94:1487	WHC-SD-WM-SDD-043		94:1548	WHC-SD-WM-TP-207- Rev.1
	94:1488	WHC-SD-WM-SDD-045		94:1549	WHC-SD-WM-TP-216
	94:1489	WHC-SD-WM-SDD-048		94:1550	WHC-SD-WM-TP-217- Rev.1
	94:1490	WHC-SD-WM-SDD-049		94:1551	WHC-SD-WM-TP-218- Rev.1

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	94:1552	WHC-SD-WM-TP-219- Rev.1		94:1615	WHC-SD-WM-TP-317
	94:1553	WHC-SD-WM-TP-219- Rev.2		94:1616	WHC-SD-WM-TP-324
	94:1554	WHC-SD-WM-TP-227		94:1617	WHC-SD-WM-TP-335
	94:1555	WHC-SD-WM-TP-227- Rev.1		94:1618	WHC-SD-WM-TP-338
	94:1556	WHC-SD-WM-TP-228		94:1619	WHC-SD-WM-TP-349
	94:1557	WHC-SD-WM-TP-229		94:1620	WHC-SD-WM-TPI-016- Rev.2
	94:1558	WHC-SD-WM-TP-231		94:1621	WHC-SD-WM-TPI-016- Rev.3
	94:1559	WHC-SD-WM-TP-231- Rev.1		94:1622	WHC-SD-WM-TPI-017
	94:1560	WHC-SD-WM-TP-240		94:1623	WHC-SD-WM-TRP-105- Rev.5
	94:1561	WHC-SD-WM-TP-241		94:1624	WHC-SD-WM-TRP-105- Rev.6
	94:1562	WHC-SD-WM-TP-243		94:1625	WHC-SD-WM-TRP-106- Rev.5
	94:1563	WHC-SD-WM-TP-247		94:1626	WHC-SD-WM-TRP-106- Rev.6
	94:1564	WHC-SD-WM-TP-249		94:1627	WHC-SD-WM-TRP-107- Rev.5
	94:1565	WHC-SD-WM-TP-250		94:1628	WHC-SD-WM-TRP-107- Rev.6
	94:1566	WHC-SD-WM-TP-254		94:1629	WHC-SD-WM-TRP-108- Rev.4
	94:1567	WHC-SD-WM-TP-257		94:1630	WHC-SD-WM-TRP-109- Rev.4
	94:1568	WHC-SD-WM-TP-259		94:1632	WHC-SD-WM-TRP-111- Rev.5
	94:1569	WHC-SD-WM-TP-259- Rev.1		94:1633	WHC-SD-WM-TRP-112- Rev.5
	94:1570	WHC-SD-WM-TP-263		94:1634	WHC-SD-WM-TRP-113- Rev.4
	94:1571	WHC-SD-WM-TP-265		94:1635	WHC-SD-WM-TRP-113- Rev.5
	94:1572	WHC-SD-WM-TP-266		94:1636	WHC-SD-WM-TRP-114- Rev.5
	94:1573	WHC-SD-WM-TP-267		94:1637	WHC-SD-WM-TRP-114- Rev.6
	94:1574	WHC-SD-WM-TP-268		94:1638	WHC-SD-WM-TRP-201
	94:1575	WHC-SD-WM-TP-271		94:1639	WHC-SD-WM-TRP-202
	94:1576	WHC-SD-WM-TP-273		94:1640	WHC-SD-WM-TRP-208
	94:1577	WHC-SD-WM-TP-274		94:1641	WHC-SD-WM-TRP-209
	94:1578	WHC-SD-WM-TP-275		94:1642	WHC-SD-WM-TRP-211
	94:1579	WHC-SD-WM-TP-276		94:1643	WHC-SD-WM-TRP-215
	94:1580	WHC-SD-WM-TP-277		94:1644	WHC-SD-WM-TRP-218
	94:1581	WHC-SD-WM-TP-277- Rev.1		94:1645	WHC-SD-WM-TRP-223
	94:1582	WHC-SD-WM-TP-279		94:1646	WHC-SD-WM-TRP-225
	94:1583	WHC-SD-WM-TP-280		94:1647	WHC-SD-WM-TRP-229
	94:1584	WHC-SD-WM-TP-281		94:1648	WHC-SD-WM-TRP-230
	94:1585	WHC-SD-WM-TP-283		94:1649	WHC-SD-WM-UM-029
	94:1586	WHC-SD-WM-TP-284		94:1650	WHC-SD-WM-VI-017
	94:1587	WHC-SD-WM-TP-285		94:1651	WHC-SD-WM-VI-018
	94:1588	WHC-SD-WM-TP-285- Rev.1		94:1652	WHC-SD-WM-WP-072- Rev.3
	94:1589	WHC-SD-WM-TP-286		94:1653	WHC-SD-WM-WP-132- Rev.4
	94:1590	WHC-SD-WM-TP-286- Rev.1		94:1654	WHC-SD-WM-WP-132- Rev.5
	94:1591	WHC-SD-WM-TP-288		94:1655	WHC-SD-WM-WP-174- Rev.1
	94:1592	WHC-SD-WM-TP-289		94:1656	WHC-SD-WM-WP-218- Rev.1
	94:1593	WHC-SD-WM-TP-290		94:1657	WHC-SD-WM-WP-264
	94:1594	WHC-SD-WM-TP-293		94:1658	WHC-SD-WM-WP-283
	94:1595	WHC-SD-WM-TP-294		94:1659	WHC-SD-WM-WP-284
	94:1596	WHC-SD-WM-TP-295		94:1660	WHC-SD-WM-WP-285
	94:1597	WHC-SD-WM-TP-296		94:1661	WHC-SD-WM-WP-287
	94:1598	WHC-SD-WM-TP-297		94:1662	WHC-SD-WM-WP-289
	94:1599	WHC-SD-WM-TP-298			
	94:1600	WHC-SD-WM-TP-299			
	94:1601	WHC-SD-WM-TP-300			
	94:1602	WHC-SD-WM-TP-301			
	94:1603	WHC-SD-WM-TP-302			
	94:1604	WHC-SD-WM-TP-304			
	94:1605	WHC-SD-WM-TP-305			
	94:1606	WHC-SD-WM-TP-306			
	94:1607	WHC-SD-WM-TP-307			
	94:1608	WHC-SD-WM-TP-308			
	94:1609	WHC-SD-WM-TP-309			
	94:1610	WHC-SD-WM-TP-310			
	94:1611	WHC-SD-WM-TP-311			
	94:1612	WHC-SD-WM-TP-312			
	94:1613	WHC-SD-WM-TP-313			
	94:1614	WHC-SD-WM-TP-314			

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	94:1663	WHC-SD-WM-WP-289-Rev.1		94:2140	WHC-SD-CP-SA-023-Rev.1
	94:1664	WHC-SD-WM-WP-291		94:2141	WHC-SD-CP-SA-027
	94:1665	WHC-SD-WM-WP-295		94:2142	WHC-SD-CP-SA-028
	94:1666	WHC-SD-WM-WP-301		94:2143	WHC-SD-CP-SAR-021-Vol.1
	94:1667	WHC-SP-1101-Vol.1		94:2144	WHC-SD-CP-SAR-021-Vol.2
	94:1668	WHC-SP-1101-Vol.2		94:2145	WHC-SD-CP-TC-031
	94:1669	WHC-SP-1101-Vol.3		94:2146	WHC-SD-CP-TC-032-Rev.1
	94:1670	WHC-SP-1101-Vol.4		94:2147	WHC-SD-CP-TEEM-069
	94:1671	WHC-SP-1101-Vol.5		94:2148	WHC-SD-CP-TI-108-Rev.14
	94:1672	WHC-SP-1137		94:2149	WHC-SD-CP-TI-193-Rev.1
	94:1673	WHC-SP-1143		94:2150	WHC-SD-CP-TI-194
	94:1674	WHC-SP-2332		94:2151	WHC-SD-CP-TP-082
	94:1888	WHC-EP-0834		94:2152	WHC-SD-CP-TP-083
	94:1889	WHC-SA-1968		94:2153	WHC-SD-CP-TP-084
	94:1890	WHC-SD-EN-AP-159		94:2154	WHC-SD-CP-TRP-060
	94:1891	WHC-SD-WM-RPT-139		94:2155	WHC-SD-EN-AP-166
	94:1984	DOE/RL-94-29		94:2156	WHC-SD-EN-AP-171
	94:2011	DOE/RL-94-127		94:2157	WHC-SD-EN-AP-172
	94:2095	WHC-EP-0446-2		94:2158	WHC-SD-EN-AP-177
	94:2096	WHC-EP-0467-Rev.1		94:2160	WHC-SD-EN-TI-210
	94:2097	WHC-EP-0468-3		94:2161	WHC-SD-EN-TI-213
	94:2098	WHC-EP-0549-Vol.3-4		94:2162	WHC-SD-EN-TI-217
	94:2099	WHC-EP-0573-2		94:2163	WHC-SD-EN-TI-247
	94:2100	WHC-EP-0829		94:2164	WHC-SD-EN-TI-288
	94:2101	WHC-EP-0850		94:2165	WHC-SD-EN-TI-296
	94:2102	WHC-MR-0418		94:2166	WHC-SD-EN-TP-050
	94:2103	WHC-MR-0452		94:2167	WHC-SD-F031-PMP-002
	94:2104	WHC-MR-0452-Add.1		94:2168	WHC-SD-F031-QAPP-001
	94:2105	WHC-MR-0463		94:2169	WHC-SD-FF-CDR-006
	94:2106	WHC-MR-0465		94:2170	WHC-SD-FF-DRR-00018
	94:2107	WHC-SA-2077		94:2171	WHC-SD-FF-ER-099
	94:2108	WHC-SA-2141		94:2172	WHC-SD-FF-ER-101
	94:2109	WHC-SA-2403		94:2173	WHC-SD-FF-ER-102
	94:2110	WHC-SA-2413		94:2174	WHC-SD-FF-OMM-010
	94:2111	WHC-SA-2491		94:2176	WHC-SD-FF-SSP-004-Rev.1
	94:2112	WHC-SA-2516		94:2177	WHC-SD-FF-SSP-050-Rev.1
	94:2113	WHC-SA-2559		94:2178	WHC-SD-FF-SSP-052
	94:2114	WHC-SA-2568		94:2179	WHC-SD-FF-TA-034
	94:2115	WHC-SA-2583		94:2180	WHC-SD-GN-CSWD-30036-Rev.1
	94:2116	WHC-SA-2587		94:2181	WHC-SD-GN-DGS-30011
	94:2117	WHC-SA-2621		94:2182	WHC-SD-GN-ER-30034
	94:2118	WHC-SA-2633		94:2183	WHC-SD-GN-ICD-20001
	94:2119	WHC-SA-2707		94:2184	WHC-SD-GN-QAPP-001-Rev.1
	94:2120	WHC-SA-2709		94:2185	WHC-SD-GN-SDD-30007-Rev.1
	94:2121	WHC-SA-2729		94:2186	WHC-SD-GN-TRP-20014
	94:2122	WHC-SA-2782		94:2187	WHC-SD-GN-TRP-20024
	94:2123	WHC-SA-2784		94:2188	WHC-SD-GN-TRP-20025
	94:2124	WHC-SD-C018H-HC-002-Rev.1		94:2189	WHC-SD-GN-TRP-20026
	94:2125	WHC-SD-C018H-TP-010-Rev.1		94:2190	WHC-SD-GN-TRP-30010
	94:2126	WHC-SD-C217-ES-001		94:2191	WHC-SD-GN-TRP-30011
	94:2127	WHC-SD-CP-ANAL-008		94:2192	WHC-SD-GN-TRP-30018
	94:2128	WHC-SD-CP-ANAL-010		94:2193	WHC-SD-L097-ATP-005
	94:2129	WHC-SD-CP-DA-093		94:2194	WHC-SD-L205-ATP-001
	94:2130	WHC-SD-CP-ES-160		94:2195	WHC-SD-L225-ATP-001
	94:2131	WHC-SD-CP-ES-166		94:2196	WHC-SD-LL-ATR-020
	94:2132	WHC-SD-CP-HC-004		94:2197	WHC-SD-LL-ES-040
	94:2133	WHC-SD-CP-HSP-002		94:2198	WHC-SD-PRP-HA-001-Rev.2
	94:2134	WHC-SD-CP-MAR-001		94:2199	WHC-SD-PRP-HA-007
	94:2135	WHC-SD-CP-OMM-003		94:2200	WHC-SD-PRP-HA-008
	94:2136	WHC-SD-CP-OTP-152-Rev.1			
	94:2137	WHC-SD-CP-PLN-027-Rev.1			
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	94:2202	WHC-SD-PRP-HA-011		94:2267	WHC-SP-1094-FY94
	94:2203	WHC-SD-PRP-HA-012		94:2268	WHC-SP-1108
	94:2204	WHC-SD-PRP-HA-013		94:2269	WHC-SP-1112
	94:2205	WHC-SD-PRP-HA-014		94:2270	WHC-SP-1116
	94:2206	WHC-SD-PRP-HA-015		94:2271	WHC-SP-1126-Vol.1
	94:2208	WHC-SD-PRP-HA-017		94:2272	WHC-SP-1126-Vol.2
	94:2209	WHC-SD-RE-SEL-001- Rev.2		94:2273	WHC-SP-1126-Vol.3
	94:2210	WHC-SD-RTG-WP-001		94:2274	WHC-SP-1139
	94:2211	WHC-SD-SNF-ATP-006		94:2275	WHC-SP-1147
	94:2212	WHC-SD-SNF-ATR-003		94:2276	WHC-SP-1149
	94:2213	WHC-SD-SNF-CM-002		94:2277	WHC-SP-1154
	94:2214	WHC-SD-SNF-CMD-001		94:2353	WHC-SA-2302
	94:2215	WHC-SD-SNF-CR-001		94:2354	WHC-SA-2448
	94:2216	WHC-SD-SNF-CR-002		94:2355	WHC-SA-2627
	94:2217	WHC-SD-SNF-CSER-001		94:2356	WHC-SA-2664
	94:2218	WHC-SD-SNF-CSER-002		94:2357	WHC-SA-2705
	94:2219	WHC-SD-SNF-DA-009		94:2358	WHC-SD-TD-CR-001
	94:2220	WHC-SD-SNF-DRR-002- Vol.1		94:2359	WHC-SD-TD-ER-004
	94:2221	WHC-SD-SNF-DRR-002- Vol.2		94:2360	WHC-SD-TD-ICD-001
	94:2222	WHC-SD-SNF-EDL-001		94:2412	DOE-0252
	94:2223	WHC-SD-SNF-ER-004		94:2448	DOE/RL-94-106-Rev.1
	94:2224	WHC-SD-SNF-FVP-001		94:2596	WHC-EP-0544-Rev.1
	94:2225	WHC-SD-SNF-FVP-002		94:2597	WHC-EP-0707
	94:2226	WHC-SD-SNF-LB-001		94:2598	WHC-EP-0718
	94:2227	WHC-SD-SNF-PCP-001- Rev.1		94:2599	WHC-EP-0722
	94:2228	WHC-SD-SNF-TC-001		94:2600	WHC-EP-0722-Add.2
	94:2229	WHC-SD-SP-PHA-001		94:2601	WHC-EP-0722-Add.3-Draft
	94:2230	WHC-SD-SP-SSP-001		94:2602	WHC-EP-0741
	94:2231	WHC-SD-TP-RPT-015		94:2603	WHC-EP-0768
	94:2232	WHC-SD-TP-RPT-017		94:2604	WHC-EP-0769
	94:2233	WHC-SD-TP-RPT-018		94:2605	WHC-EP-0779-Draft
	94:2234	WHC-SD-TP-SEP-029		94:2606	WHC-EP-0783-Draft
	94:2235	WHC-SD-TP-UM-002- Rev.1		94:2607	WHC-EP-0787
	94:2236	WHC-SD-W059-PSE-002		94:2608	WHC-EP-0790
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	94:2238	WHC-SD-WM-ANAL-039		94:2610	WHC-EP-0801-Draft
	94:2239	WHC-SD-WM-ANAL-040		94:2611	WHC-EP-0822
	94:2240	WHC-SD-WM-ATP-104		94:2612	WHC-EP-0823
	94:2241	WHC-SD-WM-ATR-117		94:2613	WHC-EP-0830-Vol.1
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	94:2243	WHC-SD-WM-DA-177		94:2615	WHC-EP-0830-Vol.3
	94:2244	WHC-SD-WM-DA-188		94:2616	WHC-EP-0848
	94:2245	WHC-SD-WM-DCR-002		94:2617	WHC-EP-0852
	94:2246	WHC-SD-WM-DP-068		94:2618	WHC-MR-0489
	94:2247	WHC-SD-WM-ES-313		94:2619	WHC-SA-1455
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	94:2250	WHC-SD-WM-EV-073		94:2622	WHC-SA-2393
	94:2251	WHC-SD-WM-OMM-011		94:2623	WHC-SA-2425
	94:2252	WHC-SD-WM-OTP-169		94:2624	WHC-SA-2433
	94:2253	WHC-SD-WM-OTP-172		94:2625	WHC-SA-2452
	94:2254	WHC-SD-WM-OTR-163		94:2626	WHC-SA-2453
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	94:2256	WHC-SD-WM-OTR-172		94:2628	WHC-SA-2505
	94:2257	WHC-SD-WM-PICD-004		94:2629	WHC-SA-2551
	94:2258	WHC-SD-WM-PICD-006		94:2630	WHC-SA-2569
	94:2259	WHC-SD-WM-TI-616		94:2631	WHC-SA-2609
	94:2260	WHC-SD-WM-TI-675		94:2632	WHC-SA-2625
	94:2261	WHC-SD-WM-TPP-052		94:2633	WHC-SA-2628
	94:2262	WHC-SD-WM-UM-019		94:2634	WHC-SA-2772
	94:2263	WHC-SP-0564-33		94:2635	WHC-SD-CP-ES-165
	94:2264	WHC-SP-0841-Rev.2		94:2636	WHC-SD-CP-HC-005
	94:2265	WHC-SP-0849		94:2637	WHC-SD-CP-PLN-028
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	94:2643	WHC-SD-CP-TP-079		94:2704	WHC-SD-SNF-SM-001
	94:2644	WHC-SD-CP-TP-080		94:2705	WHC-SD-SNF-SM-002
	94:2645	WHC-SD-EN-AP-093		94:2706	WHC-SD-SNF-TA-002
	94:2646	WHC-SD-EN-RA-005		94:2707	WHC-SD-SNF-TA-003
	94:2647	WHC-SD-EN-RPT-010		94:2708	WHC-SD-SNF-TA-004
	94:2648	WHC-SD-EN-RPT-011		94:2709	WHC-SD-SNF-TA-005
	94:2649	WHC-SD-EN-TI-241		94:2710	WHC-SD-SNF-TC-002
	94:2650	WHC-SD-EN-TI-268		94:2711	WHC-SD-SNF-TI-002
	94:2651	WHC-SD-EN-TI-279		94:2712	WHC-SD-SNF-TI-004
	94:2652	WHC-SD-EN-TI-285		94:2713	WHC-SD-SNF-TI-010
	94:2653	WHC-SD-ER3641-ATP- 003-Rev.1		94:2714	WHC-SD-SNF-TI-012
	94:2654	WHC-SD-FF-CSWL- 00016-Rev.1		94:2715	WHC-SD-SNF-TP-003
	94:2655	WHC-SD-GN-SA-30006		94:2716	WHC-SD-SNF-TP-004
	94:2656	WHC-SD-GN-TA-30004		94:2718	WHC-SD-SNF-TP-008
	94:2657	WHC-SD-HWV-UM-004- Rev.1		94:2719	WHC-SD-SNF-TP-008- Rev.1
	94:2658	WHC-SD-HWV-WP-005		94:2720	WHC-SD-SNF-TP-009
	94:2659	WHC-SD-NR-ANAL-014		94:2721	WHC-SD-SNF-TP-009- Rev.1
	94:2660	WHC-SD-NR-CSER-011- Rev.1		94:2722	WHC-SD-SNF-TP-010
	94:2661	WHC-SD-NR-CSER-013		94:2723	WHC-SD-SNF-TP-011
	94:2662	WHC-SD-NR-CSER-014- Rev.1		94:2724	WHC-SD-SNF-TP-012
	94:2663	WHC-SD-NR-CSER-015		94:2725	WHC-SD-SNF-TP-013
	94:2664	WHC-SD-NR-ER-105		94:2726	WHC-SD-SNF-TRP-001
	94:2665	WHC-SD-PRP-HA-005		94:2727	WHC-SD-SNF-TRP-002
	94:2666	WHC-SD-SNF-AP-001		94:2728	WHC-SD-SNF-TRP-003
	94:2667	WHC-SD-SNF-DA-004		94:2729	WHC-SD-SNF-TRP-004
	94:2668	WHC-SD-SNF-DQO-001		94:2730	WHC-SD-SNF-WP-001
	94:2669	WHC-SD-SNF-DQO-002		94:2731	WHC-SD-SNF-WP-007
	94:2670	WHC-SD-SNF-DQO-003		94:2732	WHC-SD-SNF-WP-010
	94:2671	WHC-SD-SNF-DR-001		94:2733	WHC-SD-SNF-WP-011
	94:2672	WHC-SD-SNF-DRP-001		94:2734	WHC-SD-SNF-WP-012
	94:2673	WHC-SD-SNF-ER-002		94:2735	WHC-SD-SQA-CSA-20374
	94:2674	WHC-SD-SNF-ER-003		94:2736	WHC-SD-SQA-CSA-20376
	94:2675	WHC-SD-SNF-ES-006		94:2737	WHC-SD-SQA-CSA-20377
	94:2676	WHC-SD-SNF-ES-007		94:2738	WHC-SD-SQA-CSA-20380
	94:2677	WHC-SD-SNF-ES-008		94:2739	WHC-SD-SQA-CSA-20381
	94:2678	WHC-SD-SNF-FDC-001		94:2740	WHC-SD-SQA-CSA-20382
	94:2679	WHC-SD-SNF-FDC-001- Rev.1		94:2741	WHC-SD-SQA-CSA-20383
	94:2680	WHC-SD-SNF-FDR-001		94:2742	WHC-SD-SQA-CSA-20384
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	94:2683	WHC-SD-SNF-FRD-007		94:2745	WHC-SD-SQA-TA-20015- Rev.1
	94:2684	WHC-SD-SNF-HC-001		94:2746	WHC-SD-TP-ANAL-002
	94:2685	WHC-SD-SNF-HC-002- Rev.1		94:2747	WHC-SD-TP-PDC-001- Rev.1
	94:2686	WHC-SD-SNF-PCP-001		94:2748	WHC-SD-TP-PDC-022
	94:2687	WHC-SD-SNF-PD-001		94:2749	WHC-SD-TP-PDC-026
	94:2688	WHC-SD-SNF-PD-007		94:2750	WHC-SD-TP-SEP-028
	94:2689	WHC-SD-SNF-PD-009		94:2751	WHC-SD-TP-SEP-030
	94:2690	WHC-SD-SNF-PHA-001		94:2752	WHC-SD-TPWP-001
	94:2691	WHC-SD-SNF-PLN-001		94:2753	WHC-SD-W025-ATR-001- Rev.1
	94:2692	WHC-SD-SNF-PLN-004		94:2754	WHC-SD-W026-OCD-001
	94:2693	WHC-SD-SNF-PMP-002		94:2755	WHC-SD-W026-SDD-001
	94:2694	WHC-SD-SNF-PMP-008		94:2756	WHC-SD-W026-SDP-001
	94:2695	WHC-SD-SNF-PTR-001		94:2757	WHC-SD-W026-TI-006- Rev.1
	94:2696	WHC-SD-SNF-RA-001		94:2758	WHC-SD-W026-TI-009
	94:2697	WHC-SD-SNF-SARR-001		94:2759	WHC-SD-W059-FDC-002
	94:2698	WHC-SD-SNF-SARR-002- Rev.2		94:2760	WHC-SD-W059-FHA-001
	94:2699	WHC-SD-SNF-SARR-002- Rev.3		94:2761	WHC-SD-W059-FRD-001- Rev.1
	94:2700	WHC-SD-SNF-SARR-003		94:2762	WHC-SD-W087-FDC-001- Rev.3
	94:2701	WHC-SD-SNF-SARR-004		94:2763	WHC-SD-W087-PMP-001- Rev.1
	94:2702	WHC-SD-SNF-SD-002		94:2764	WHC-SD-W100-TI-009
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	94:2766	WHC-SD-W-113-ODC-001		94:2827	WHC-SD-WM-TRP-197
	94:2767	WHC-SD-W221-DP-001		94:2828	WHC-SD-WM-TRP-212
	94:2768	WHC-SD-W221-ES-002		94:2829	WHC-SD-WM-TRP-227
	94:2769	WHC-SD-W272-HC-001-Rev.1		94:2830	WHC-SD-WM-TRP-236
	94:2770	WHC-SD-W337-ATP-001		94:2831	WHC-SD-WM-TS-005
	94:2771	WHC-SD-W337-OTP-001		94:2832	WHC-SD-WM-UM-027
	94:2772	WHC-SD-W405-CR-001		94:2833	WHC-SD-WM-WP-286
	94:2773	WHC-SD-W405-PD-001		94:2834	WHC-SD-WM-WP-293
	94:2774	WHC-SD-W405-PD-002		94:2835	WHC-SP-1011D-Draft
	94:2775	WHC-SD-WM-ANAL-037		94:2836	WHC-SP-1104
	94:2776	WHC-SD-WM-ANAL-038		94:2837	WHC-SP-1110
	94:2777	WHC-SD-WM-AP-030-Rev.1		94:2838	WHC-SP-1114
	94:2778	WHC-SD-WM-ATP-102		94:2839	WHC-SP-1115
	94:2779	WHC-SD-WM-ATP-103		94:2840	WHC-SP-1119
	94:2780	WHC-SD-WM-ATP-105		94:2841	WHC-SP-1122-Vol.1
	94:2781	WHC-SD-WM-ATP-108		94:2842	WHC-SP-1122-Vol.2
	94:2782	WHC-SD-WM-ATP-110		94:2843	WHC-SP-1122-Vol.3
	94:2783	WHC-SD-WM-ATP-111		94:2844	WHC-SP-1122-Vol.4
	94:2784	WHC-SD-WM-ATP-111-Rev.1		94:2845	WHC-SP-1126-Vol.4
	94:2785	WHC-SD-WM-ATP-114		94:2846	WHC-SP-1142
	94:2786	WHC-SD-WM-ATP-115		94:2931	WHC-EP-0766
	94:2787	WHC-SD-WM-ATP-117		94:2932	WHC-EP-0832
	94:2788	WHC-SD-WM-ATR-089		94:2933	WHC-SA-2480
	94:2789	WHC-SD-WM-ATR-110		94:2934	WHC-SD-WM-ES-333
	94:2790	WHC-SD-WM-CM-002		94:2935	WHC-SD-WM-TI-643
	94:2791	WHC-SD-WM-CSD-004		94:3053	WHC-SA-2209
	94:2792	WHC-SD-WM-CSRS-007-Rev.2		94:3054	WHC-SA-2210
	94:2793	WHC-SD-WM-DP-067-Add.1A		94:3055	WHC-SA-2282
	94:2794	WHC-SD-WM-DTR-033		94:3056	WHC-SA-2434
	94:2795	WHC-SD-WM-ES-288		94:3057	WHC-SA-2594
	94:2796	WHC-SD-WM-EV-060-Rev.4		94:3058	WHC-SA-2657
	94:2797	WHC-SD-WM-FHA-003		94:3059	WHC-SA-2683
	94:2798	WHC-SD-WM-IP-007		94:3060	WHC-SA-2723
	94:2799	WHC-SD-WM-ISE-003		94:3061	WHC-SA-2745
	94:2800	WHC-SD-WM-MAR-004		94:3062	WHC-SA-2753
	94:2801	WHC-SD-WM-OTP-170		94:3063	WHC-SD-CP-TR-006
	94:2802	WHC-SD-WM-OTR-156		94:3064	WHC-SD-GN-ISE-30001
	94:2803	WHC-SD-WM-PICD-002		94:3065	WHC-SD-T100-CDR-001
	94:2804	WHC-SD-WM-PLN-055-Rev.2		94:3066	WHC-SD-T100-FDC-001-Rev.1
	94:2805	WHC-SD-WM-PMP-014		94:3067	WHC-SD-T100-PLN-001
	94:2806	WHC-SD-WM-PROC-009-Rev.1		94:3068	WHC-SD-T100-PMP-001
	94:2807	WHC-SD-WM-PRS-014		94:3069	WHC-SD-T100-QAPP-001
	94:2808	WHC-SD-WM-PTR-011		94:3070	WHC-SD-WM-CM-012
	94:2809	WHC-SD-WM-RPT-096		94:3071	WHC-SD-WM-TR-024-Rev.1
	94:2810	WHC-SD-WM-RPT-118		94:3072	WHC-SP-1096
	94:2811	WHC-SD-WM-SDD-041		94:3073	WHC-SP-1098
	94:2812	WHC-SD-WM-SDP-011		94:3074	WHC-SP-1109
	94:2813	WHC-SD-WM-SP-008		General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation	
	94:2814	WHC-SD-WM-SP-010		94:2819	WHC-SD-WM-TI-607
	94:2815	WHC-SD-WM-SWD-015		Rockwell International Corp., Richland, WA (United States). Rockwell Hanford Operations	
	94:2816	WHC-SD-WM-SWD-033		94:2588	SD-WM-TP-30
	94:2817	WHC-SD-WM-TA-161		Pacific Northwest Lab., Richland, WA (United States)	
	94:2818	WHC-SD-WM-TC-054		94:198	PNL-SA-24081
	94:2820	WHC-SD-WM-TI-608-Rev.1		94:977	PNL-10100
	94:2821	WHC-SD-WM-TI-654		USDOE Richland Operations Office, WA (United States)	
	94:2822	WHC-SD-WM-TI-659		94:574	DOE/RL-94-45
	94:2823	WHC-SD-WM-TI-672		94:1971	DOE/RL-93-29
	94:2824	WHC-SD-WM-TI-680		94:2441	DOE/RL-91-36-Rev.2
	94:2825	WHC-SD-WM-TI-685		Westinghouse Hanford Co., Shippingport, PA (United States)	
				94:1631	WHC-SD-WM-TRP-109-Rev.5

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	Westinghouse Savannah River Co., Aiken, SC (United States)			94:1998	DOE/RL-94-66-Draft-A
	94:1207	WHC-SD-WM-ANAL-033-Vol.1		94:1999	DOE/RL-94-67-Draft-A
	94:1220	WHC-SD-WM-ATP-023-Rev.6		94:2001	DOE/RL-94-99-Draft-A
	94:1283	WHC-SD-WM-DA-170		94:2002	DOE/RL-94-100-Draft-A
	94:1360	WHC-SD-WM-ER-379		94:2003	DOE/RL-94-101-Draft-A
	94:1458	WHC-SD-WM-PLN-092		94:2004	DOE/RL-94-102-Draft-A
	94:2175	WHC-SD-FF-PSE-002		94:2006	DOE/RL-94-107-Rev.1
	94:2207	WHC-SD-PRP-HA-016		94:2007	DOE/RL-94-108
	94:2717	WHC-SD-SNF-TP-007		94:2017	DOE/RL-94-152
	Corps of Engineers, Walla Walla, WA (United States). Engineering Div.			Bechtel Hanford, Inc., Richland, WA (United States)	
	94:322	WHC-SD-W252-ACDR-001		94:15	DOE/RL-94-46
	ICF Kaiser Hanford Co., Richland, WA (United States)			94:566	DOE/RL-92-63-Rev.2
	94:1329	WHC-SD-WM-ER-308		94:1992	DOE/RL-94-59-Draft-A
	94:1331	WHC-SD-WM-ER-310		94:2385	BHI-00007
	94:1333	WHC-SD-WM-ER-312		Bechtel National, Inc., Richland, WA (United States)	
	94:1335	WHC-SD-WM-ER-323		94:77	DOE/RL-93-33-Draft-A
	94:1342	WHC-SD-WM-ER-351		94:86	DOE/RL-94-132-Draft-A
AC06-89RL11615	Westinghouse Hanford Co., Richland, WA (United States)			94:561	DOE/RL-90-22-Draft-F
	94:808	WHC-SD-W025-RPT-001		94:580	DOE/RL-94-103-Vol.1
AC06-91RL11946	Raytheon Engineers and Constructors, Inc., Philadelphia, PA (United States)			94:581	DOE/RL-94-103-Vol.2
	94:2449	DOE/RL/11946-T2-Vol.1		94:582	DOE/RL-94-103-Vol.3
	94:2450	DOE/RL/11946-T2-Vol.2		94:583	DOE/RL-94-103-Vol.4
AC06-93RL12359	Westinghouse Hanford Co., Richland, WA (United States)			94:1925	DOE/EA-0984-Draft-B
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(United States). Idaho National Engi-
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EG and G Idaho, Inc., Idaho Falls, ID
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	Packaging Technology, Inc., Tacoma, WA (United States)			94:2364	WSRC-MS-94-0658
	94:2040	INEL-94/0059		94:2520	PATENTS-US-A7933153
AC08-92NV10972	International Technology, Inc., Las Ve- gas, NV (United States)			94:2589	SWE-SWB-95-0004
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	IT Corp., Las Vegas, NV (United States)			94:2861	WSRC-MS-94-0590
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AC08-93NV11265	EG and G, Inc., Las Vegas, NV (United States). Remote Sensing Lab.			94:2863	WSRC-MS-94-0618
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	EG and G Energy Measurements, Inc., Santa Barbara, CA (United States). Special Technologies Lab.			94:2867	WSRC-RP-94-396
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	94:346	WSRC-TR-94-0346		Carnegie-Mellon Univ., Pittsburgh, PA (United States)	
	94:347	WSRC-TR-94-0347		94:2314	DOE/MC/29104-95/C0411
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	94:351	WSRC-TR-94-0544		Chemical Waste Management, Inc., An- derson, SC (United States)	
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AC21-92MC29106	Coleman Research Corp., Columbia, MD (United States)		AC21-93MC30171	Molten Metals Technology, Inc., Waltham, MA (United States)	
	94:2430 DOE/MC/29106-95/C0427			94:523 DOE/MC/30171-94/C0344	
AC21-92MC29107	Delphi Research, Inc., Albuquerque, NM (United States)			94:1950 DOE/MC/30171-95/C0434	
	94:498 DOE/MC/29107-94/C0341		AC21-93MC30172	Science and Engineering Associates, Inc., Santa Fe, NM (United States)	
	94:499 DOE/MC/29107-95/C0412			94:1951 DOE/MC/30172-95/C0433	
	94:500 DOE/MC/29107-95/C0413		AC21-93MC30173	USDOE Morgantown Energy Technology Center, WV (United States)	
AC21-92MC29109	Department of Energy, Morgantown, WV (United States). Morgantown Energy Technology Center			94:526 DOE/METC-95/1014	
	94:505 DOE/MC/29109-3979			Bio-Imaging Research, Inc., Lincolnshire, IL (United States)	
	Engineering Computer Optoeconomics, Inc., Annapolis, MD (United States)			94:2323 DOE/MC/30173-95/C0414	
	94:501 DOE/MC/29109-95/C0431		AC21-93MC30174	General Electric Co., Schenectady, NY (United States). Research and Development Center	
	94:502 DOE/MC/29109-3898			94:1952 DOE/MC/30174-95/C0446	
	94:503 DOE/MC/29109-3977		AC21-93MC30175	Physical Sciences, Inc., Andover, MA (United States)	
	94:504 DOE/MC/29109-3978			94:524 DOE/MC/30175-95/C0439	
AC21-92MC29110	General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center		AC21-93MC30176	Coleman Research Corp., Springfield, VA (United States)	
	94:57 DOE/MC/29110-3879			94:1953 DOE/MC/30176-3937	
AC21-92MC29111	INTERA, Inc., Austin, TX (United States)			Membrane Technology and Research, Inc., Menlo Park, CA (United States)	
	94:58 DOE/MC/29111-95/C0441		AC21-93MC30179	94:1954 DOE/MC/30179-95/C0440	
AC21-92MC29113	Mechanical Technology, Inc., Latham, NY (United States)		AC21-94MC29249	KAI Technologies, Inc., Woburn, MA (United States)	
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	94:2318 DOE/MC/29113-3766-Pt.1		AC22-88ID12735	Argonne National Lab., IL (United States)	
	94:2319 DOE/MC/29113-3766-Pt.2			94:21 ANL/CMT/CP-82133	
	94:2320 DOE/MC/29113-3912			94:1706 ANL/CMT/CP-82509	
AC21-92MC29115	South Carolina Univ., Columbia, SC (United States). Dept. of Electrical and Computer Engineering			MSE, Inc., Butte, MT (United States)	
	94:2321 DOE/MC/29115-95/C0403			94:472 DOE/ID/12735-T30	
	South Carolina Universities Research, Clemson, SC (United States)			94:473 DOE/ID/12735-T31	
	94:2322 DOE/MC/29115-95/C0415			94:474 DOE/ID/12735-T34	
AC21-92MC29116	SRI International, Menlo Park, CA (United States)		AC24-92OR21972	Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project	
	94:506 DOE/MC/29116-3799			94:1854 FEMP-2370	
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	94:508 DOE/MC/29116-3913			94:3008 FEMP-2394	
	94:509 DOE/MC/29116-3956			Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)	
AC21-92MC29118	Transducer Research, Inc., Naperville, IL (United States)			94:93 FEMP/SUB-058	
	94:510 DOE/MC/29118-95/C0428			94:2478 FEMP-2387	
	94:528 DOE/METC/C-95/7163			94:3009 FEMP-2396	
AC21-92MC29119	UTD, Inc., Newington, VA (United States)			Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States)	
	94:59 DOE/MC/29119-95/C0429			94:2477 FEMP-2336	
	94:60 DOE/MC/29119-3881			EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
AC21-92MC29120	USDOE Morgantown Energy Technology Center, WV (United States)		AC34-90DP62349	94:2083 RFP-4810	
	94:527 DOE/METC-95/1014			EG and G Rocky Flats, Inc., Golden, CO (United States)	
	Vortec Corp., Collegeville, PA (United States)			94:223 RFP-4900	
	94:511 DOE/MC/29120-95/C0416		AC34-90RF62349	94:700 RFP-4831	
AC21-93MC30162	Isotron Corp., New Orleans, LA (United States)			94:702 RFP-4927	
	94:1947 DOE/MC/30162-95/C0435			EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
AC21-93MC30164	Textron, Inc., Everett, MA (United States). Textron Defense Systems			94:701 RFP-4903	
	94:1948 DOE/MC/30164-4000			National Environmental Technology Applications Center, Pittsburgh, PA (United States)	
AC21-93MC30168	Babcock and Wilcox Co., Alliance, OH (United States)		AI01-92EW50619	94:9 DOE/EW/50619-T1	
	94:1949 DOE/MC/30168-94/C0348				
AC21-93MC30170	Manufacturing Sciences Corp., Oak Ridge, TN (United States)				
	94:1836 DOE/MC/30170-95/C0438				

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	94:7 DOE/CH/10618-T2			94:461 DOE/CH/10575-T2	
AI05-89OR21865	Geological Survey, Las Vegas, NV (United States)		FG02-94ER54235	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	94:66 DOE/OR/21865-1			94:470 DOE/ER/54235-1	
AI05-90OR21921	Oak Ridge National Lab., TN (United States)		FG04-91AL65779	New Mexico Environment Dept., Santa Fe, NM (United States)	
	94:2406 CONF-941144-107			94:2416 DOE/AL/65779-T1	
AR21-93MC30357	Mirage Systems, Sunnyvale, CA (United States)		FG06-89ER75522	94:374 Journal article	
	94:2431 DOE/MC/30357-95/C0418		FG07-91ID13042	Idaho State Univ., Pocatello, ID (United States)	
AR21-93MC30358	Geophex Ltd., Raleigh, NC (United States)			94:53 DOE/ID/13042-38	
	94:2432 DOE/MC/30358-95/C0432			Idaho State Government, Boise, ID (United States)	
AR21-93MC30362	Carnegie-Mellon Univ., Pittsburgh, PA (United States). Robotics Inst.			94:475 DOE/ID/13042-37	
	94:2324 DOE/MC/30362-95/C0405			Idaho INEL Oversight Program, Boise, ID (United States)	
AR21-94MC30359	F2 Associates, Albuquerque, NM (United States)			94:54 DOE/ID/13042-39	
	94:1955 DOE/MC/30359-95/C0420		FG07-93ID13220	Idaho National Engineering Lab., Idaho Falls, ID (United States)	
	94:1956 DOE/MC/30359-3990			94:476 DOE/ID/13220-T2	
AR21-94MC30360	Weiss Associates, Emeryville, CA (United States)		FG09-94SR18445	North Carolina Agricultural and Technical State Univ., Greensboro, NC (United States)	
	94:61 DOE/MC/30360-95/C0425			94:2990 DOE/SR/18445-T1	
AR21-94MC31185	Monsanto Co., Paducah, KY (United States)		W-31-109-ENG-38	Argonne National Lab., IL (United States)	
	94:525 DOE/MC/31185-94/C0347			94:411 ANL/ES/CP-85390	
FC21-92MC28245	Atomic Energy of Canada Ltd., Chalk River, ON (Canada)			GTS Duratek, Columbia, MD (United States)	
	94:494 DOE/MC/28245-3909			94:460 DOE/CH-9504	
	94:495 DOE/MC/28245-3922		W-31109-ENG-38	Argonne National Lab., Idaho Falls, ID (United States)	
FC21-92MC29467	West Virginia Univ., Morgantown, WV (United States)			94:417 ANL/TD/CP-83149	
	94:519 DOE/MC/29467-3877			Argonne National Lab., IL (United States)	
	National Research Center for Coal and Energy, Morgantown, WV (United States)			94:1 ANL/EA/CP-80973	
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84267	94:419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008277	MF-2020
84268	94:420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008291	MF-2020
ANL/TD/RP-- 85215	94:1917	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009911	MF-2050
BHI-- 00007	94:2385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005256	MF-2000
BNL-- 49873	94:421	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015149	MF-901
52436	94:535	See DOE/MWIP-30			
52444	94:917	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006728	PC-2000
52452	94:422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006729	PC-2020
60830	94:1710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002243	MF-2010
60842	94:1918	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000761	MF-2000
60977	94:1711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003953	MF-2020
61006	94:423	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005003	MF-2020

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61127	94:1712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004950	MF-2010
61292	94:1713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007301	MF-2030
61426	94:1714	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009544	MF-2010; MF-2040
61450	94:424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008366	MF-721
CAPE-3085	94:1919	OSTI		TI94019250	ND-2050
CONF-920307-		(Waste management '92; Tucson, AZ (United States); 1-5 Mar 1992)			
103	94:2619	See WHC-SA-1455			
104	94:2078	See PNL-SA-20502			
CONF-920851-		(Spectrum '92: nuclear and hazardous waste management international topical meeting; Boise, ID (United States); 23-27 Aug 1992)			
90-Rev.1	94:2592	See UCRL-JC-110055-Rev.1			
98	94:3052	See UCRL-JC-116577			
99	94:1002	See PNL-SA-20933			
CONF-9210194-		(International symposium on environmental contamination in Central and Eastern Europe; Budapest (Hungary); 12-16 Oct 1992)			
12	94:246	See UCRL-JC-117678			
CONF-921101-		(16. Materials Research Society (MRS) fall meeting; Boston, MA (United States); 30 Nov - 5 dec 1992)			
Vol.294	94:2971	Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237			ND-2070; ND-2030
CONF-921102-		(Joint American Nuclear Society/European Nuclear Society (ANS/ENS) international meeting on fifty years of controlled nuclear chain reaction: past, present, and future; Chicago, IL (United States); 15-20 Nov 1992)			
64	94:1076	See WHC-SA-1601			
CONF-9302191-		(3. international conference on chemical oxidation; Nashville, TN (United States); 17-19 Feb 1993)			
1	94:31	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018707	MF-402
CONF-930408-		(10. international high-level radioactive waste management conference; Las Vegas, NV (United States); 25-29 Apr 1993)			
84	94:425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018962	MF-2020
CONF-9304128-		(Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993)			
22	94:427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006165	MF-407
24	94:1920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006164	MF-407
CONF-930445-		(Society of Photo-Optical Instrumentation Engineers (SPIE) OE/aerospace science and sensing meeting; Orlando, FL (United States); 11-16 Apr 1993)			
29	94:426	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018661	MF-406; MF-2000
CONF-930483-		(9. waste minimization and pollution prevention conference; San Francisco, CA (United States); 13-15 Apr 1993)			
15	94:1715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007608	MF-512
CONF-9306198-		(Soil Decon '93: technology targeting radionuclides and heavy metals; Gatlinburg, TN (United States); 16-17 Jun 1993)			
	94:654	See ORNL-6769			

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CONF-930769-		(1993 joint Canadian Society of Civil Engineers- American Society of Civil Engineers (CSCE-ASCE) national conference on envi- ronmental engineering; Montreal (Canada); 12-14 Jul 1993)			
5	94:428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019116	MF-402
CONF-9308217-		(Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993)			
	94:2973	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008528	MF-902
CONF-930873-		(2. international mixed waste symposium; Balti- more, MD (United States); 17-20 Aug 1993)			
33	94:726	See WHC-SA-1787			
34	94:438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018667	MF- 2020
CONF-930905-		(Actinides '93; Santa Fe, NM (United States); 19-24 Sep 1993)			
	94:2895				
CONF-930906-		('93 international conference on nuclear waste management and environmental remediation; Prague (Czech Republic); 5-11 Sep 1993)			
21	94:256	See WHC-SA-1937			
22	94:2925	See PNL-SA-21389			
CONF-9309139-		(20. American Society for Quality Control (ASQC) national energy and environmental annual conference; Indian Wells, CA (United States); 19-22 Sep 1993)			
12	94:439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013265	MF-902
CONF-9310102-		(4. energy natural phenomena hazards mitiga- tion conference; Atlanta, GA (United States); 19-22 Oct 1993)			
46	94:1078	See WHC-SA-2016			
48	94:1077	See WHC-SA-1884			
CONF-9310264-		(1993 plutonium/uranium recovery operations conference; Augusta, GA (United States); 18-21 Oct 1993)			
4	94:2107	See WHC-SA-2077			
CONF-9310323-		(Fernald environmental management project in- dustrial workshop on waste recycling; Cincinnati, OH (United States); 5-6 Oct 1993)			
	94:2037	See FEMP/SUB-084			
CONF-9310355-		(Teleoperation '93 conference; New York, NY (United States); 19-21 Oct 1993)			
1	94:2300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018972	MF-106; MF- 2060
CONF-9310358-		(Korea automatic control conference; Seoul (Ko- rea, Republic of); 20-22 Oct 1993)			
1	94:2301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018971	MF- 2000
CONF-931085-		(Department of Energy environmental remedia- tion conference; Augusta, GA (United States); 24-28 Oct 1993)			
39-Rev.2	94:2593	See UCRL-JC-113790-Rev.2			
82	94:228	See SAND-94-0750C			
87	94:119	See LBL-35569			
CONF-9311115-		(Symposium on science of advanced batteries; Cleveland, OH (United States); 8-9 Nov 1993)			
3	94:191	See PNL-SA-22803			
CONF-9311122-		(Superfund 14: conference and exhibition; Washington, DC (United States); 30 Nov - 2 dec 1993)			
2	94:728	See WHC-SA-2162			

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CONF-931113-		(Conference on petroleum hydrocarbons and organic chemicals in ground water: prevention, detection and restoration; Houston, TX (United States); 10-12 Nov 1993)			
1 CONF-931119-	94:35	OSTI; NTIS; GPO Dep. (3. international symposium on stabilization/solidification of hazardous, radioactive and mixed wastes; Williamsburg, VA (United States); 1-5 Nov 1993)	E 1.99:	DE94018702	MF-403
4	94:36	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018037	MF-2010
CONF-931160-		(American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993)			
	94:909				
	94:1699				
	94:1700				
	94:1701				
	94:2295				
	94:2296				
	94:2297				
	94:2298				
43	94:1716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014402	MF-903
44	94:1717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014401	MF-902
45	94:941	See LA-UR-94-2019			
CONF-931188-		(17. annual training resources and data exchange conference: integrating training requirements and expectations; Indianapolis, IN (United States); 15-17 Nov 1993)			
4	94:3054	See WHC-SA-2210			
5	94:3053	See WHC-SA-2209			
CONF-931195-		(International symposium on scientific basis for nuclear waste management; Boston, MA (United States); 29 Nov - 3 dec 1993)			
4	94:2571	See SAND-94-1145C			
5	94:257	See WHC-SA-1950			
CONF-940204-		(123. annual meeting of the Minerals, Metals and Materials Society; San Francisco, CA (United States); 27 Feb - 3 mar 1994)			
11	94:2088	See SAND-94-2759C			
CONF-940209-		(Pittsburgh conference on analytical chemistry and applied spectroscopy; Chicago, IL (United States); 28 Feb - 4 mar 1994)			
4	94:727	See WHC-SA-1987			
CONF-9402105-		(6. annual meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1994)			
1	94:2109	See WHC-SA-2403			
CONF-940212-		(Seminar on developments in radioactive waste transport; Vienna (Austria); 21-25 Feb 1994)			
1	94:441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009176	MF-902
5	94:703	See SAND-94-0495C			
CONF-940216-		(Nondestructive assay and nondestructive examination waste characterization conference; Pocatello, ID (United States); 14-16 Feb 1994)			
5	94:1886	See UCRL-JC-115670			
6	94:2458	See EGG-M-94237			
8	94:1887	See UCRL-JC-118317			
89	94:1017	See PNL-SA-24951			
CONF-940225-		(Waste management '94: working towards a cleaner environment; Tucson, AZ (United States); 27 Feb - 3 mar 1994)			
108	94:689	See PNL-SA-23742			
113	94:1864	See LA-UR-94-1735			
114	94:1720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013281	MF-903
116	94:3055	See WHC-SA-2282			
117	94:2032	See FEMP-2324			
118	94:2475	See FEMP-2303			

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119	94:1852	See FEMP-2322			
120	94:1721	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017703	MF-2070
121	94:1722	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017705	MF-2010
122	94:2396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017756	MF-2070
123	94:442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017866	MF-2010
124	94:2912	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018132	MF-2020
125	94:3035	See PNL-SA-23687			
126	94:1003	See PNL-SA-21497			
127	94:587	See EGG-M-94040			
128	94:2325	See EGG-M-94023			
44	94:2084	See SAND-94-0105C			
56	94:405	See ANL/EA/CP-81120			
68	94:1	See ANL/EA/CP-80973			
75	94:1718	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008608	MF-902
78	94:1719	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008605	MF-902
CONF-940248-		(4. annual symposium on chemical oxidation; Nashville, TN (United States); 16-18 Feb 1994)			
2	94:729	See WHC-SA-2221			
CONF-940292-		(25. IECA annual conference and trade exposition; Reno, NC (United States); 15-18 Feb 1994)			
1	94:1889	See WHC-SA-1968			
CONF-940301-		(207. spring national meeting of the American Chemical Society (ACS); San Diego, CA (United States); 13-18 Mar 1994)			
27	94:2909	See ANL/CMT/CP-81057			
CONF-9403128-		(Hydrogeology, waste disposal, science and politics: 30. symposium on engineering geology and geotechnical engineering; Boise, ID (United States); 23-25 Mar 1994)			
CONF-9403130-	94:475	See DOE/ID/13042-37			
		(5. annual West Coast conference on contaminated soils and groundwater; Long Beach, CA (United States); 28 Mar - 1 apr 1994)			
1	94:258	See WHC-SA-2268			
CONF-940353-		(Symposium on the application of geophysics to environmental and engineering problems; Boston, MA (United States); 27-31 Mar 1994)			
6	94:2456	See EGG-11265-3004			
CONF-940386-		(Cost efficient acquisition and utilization of data in the management of hazardous waste sites; Herndon, VA (United States); 23-25 Mar 1994)			
4	94:2397	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013253	MF-902
CONF-940401-		(International conference on methods and applications of radioanalytical chemistry; Kona, HI (United States); 10-16 Apr 1994)			
11	94:200	See PNL-SA-24094			
14	94:2372	See ANL/CMT-ACL/CP-83255			
CONF-940406-		(International symposium on decontamination and decommissioning; Knoxville, TN (United States); 27-29 Apr 1994)			
13	94:1921	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013269	MF-906
14	94:2034	See FEMP-2330			
CONF-9404126-		(Mixed waste thermal treatment symposium; Denver, CO (United States); 12-14 Apr 1994)			
3	94:691	See PNL-SA-23972			
4	94:700	See RFP-4831			
CONF-9404143-		(Oracle CAS SIG spring '94 conference; Keystone, CO (United States); 23-26 Apr 1994)			
2	94:3056	See WHC-SA-2434			

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CONF-940416-		(96. annual meeting of the American Ceramic Society (ACS); Indianapolis, IN (United States); 25-28 Apr 1994)			
9	94:1704	See ANL/CMT/CP-81046			
11	94:2554	See PNL-SA-24139			
17	94:2548	See PNL-SA-23488			
21	94:2543	See PNL-SA-23384			
22	94:2547	See PNL-SA-23487			
23	94:2546	See PNL-SA-23454			
27	94:2545	See PNL-SA-23453			
28	94:2544	See PNL-SA-23386			
29	94:2558	See PNL-SA-24790			
CONF-9404160-		(Executive enterprises conference; Charleston, SC (United States); 25-26 Apr 1994)			
1	94:445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012658	MF-902
CONF-9404174-		(New England environmental expo; Belmont, MA (United States); 26-28 Apr 1994)			
1	94:334	See WSRC-MS-94-0252			
CONF-9404186-		(Tank waste chemical reactions meeting; Richland, WA (United States); 11 Apr 1994)			
1	94:1011	See PNL-SA-24065			
CONF-940433-		(Spring meeting of the American Institute of Chemical Engineers; Atlanta, GA (United States); 17-21 Apr 1994)			
7	94:443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019144	MF-2020
8	94:2398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000486	MF-2000
CONF-940449-		(Society of Photo-Optical Instrumentation Engineers conference on intelligent information systems; Orlando, FL (United States); 4-8 Apr 1994)			
11	94:2334	See PNL-SA-22987			
CONF-940489-		(Federal environmental restoration and waste minimization conference and exhibition; New Orleans, LA (United States); 25-29 Apr 1994)			
11	94:444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012657	MF-900
CONF-940505-		(3. international workshop on implementation of ALARA at nuclear power plants; Long Island, NY (United States); 8-11 May 1994)			
1	94:735	See WHC-SA-2435			
CONF-9405126-		(EG&G GOCO environmental conference; Las Vegas, NV (United States); 10-12 May 1994)			
4	94:89	See EGG-M-94112			
CONF-9405138-		(1994 Department of Energy configuration management workshop; Las Vegas, NV (United States); 3 May 1994)			
3	94:2992	See EGG-M-94180			
2-Vugraphs	94:2033	See FEMP-2326			
CONF-9405159-		(Unexploded ordnance detection and range-remediation conference; Golden, CO (United States); 17-19 May 1994)			
2	94:446	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94013271	
CONF-9405167-		(Measurement of toxic and related air pollutants; Durham, NC (United States); 3-6 May 1994)			
1	94:39	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013634	MF-940
CONF-9405183-		(6. national technical information exchange workshop; Kennewick, WA (United States); 10-12 May 1994)			
1	94:208	See PNL-SA-24336			
CONF-9405185-		(International symposium on the scientific and engineering aspects of deep injection disposal of hazardous and industrial wastes; Berkeley, CA (United States); 10-13 May 1994)			
1	94:3039	See PNL-SA-24157			
CONF-9405186-		(6. international ANSYS conference; Pittsburgh, PA (United States); 2-6 May 1994)			
1	94:1006	See PNL-SA-23790			

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CONF-940524-		(8. symposium on radiation measurements and applications; Ann Arbor, MI (United States); 16-19 May 1994)			
	94:370				
	94:905				
	94:2893				
14	94:732	See WHC-SA-2292			
15	94:201	See PNL-SA-24120			
CONF-940526-		(16. symposium on biotechnology for fuels and chemicals; Gatlinburg, TN (United States); 9-13 May 1994)			
7	94:192	See PNL-SA-23722			
CONF-940528-		(13. international symposium on thermal treatment technologies; Houston, TX (United States); 9-13 May 1994)			
6	94:2504	See LA-UR-94-2691			
7	94:2580	See SAND-94-8699C			
CONF-940529-		(185. Electrochemical Society meeting; San Francisco, CA (United States); 22-27 May 1994)			
11	94:2936	See WSRC-MS-94-0197			
23	94:2938	See WSRC-MS-94-0214P			
CONF-940550-		(Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics; San Diego, CA (United States); 8-13 May 1994)			
14	94:2302	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018710	MF-2060
CONF-940553-		(International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994)			
16	94:2567	See SAND-94-0482C			
19	94:2569	See SAND-94-0764C			
33	94:1705	See ANL/CMT/CP-81910			
47	94:117	See LBL-35186			
70	94:2542	See PNL-SA-23186			
CONF-940578-		(Pollution prevention conference; Denver, CO (United States); 3-5 May 1994)			
1	94:706	See SAND-94-1119C			
11	94:2031	See FEMP-2320			
CONF-940602-		(35. annual meeting of the American Nuclear Society; New Orleans, LA (United States); 11-16 Jun 1994)			
13	94:2030	See FEMP-2318			
14	94:2476	See FEMP-2329			
18	94:195	See PNL-SA-23882			
20	94:2353	See WHC-SA-2302			
CONF-940613-		(1994 pressure vessels and piping conference; Minneapolis, MN (United States); 19-23 Jun 1994)			
12	94:915	See ANL/RE/CP-82146			
13	94:916	See ANL/RE/CP-82360			
27	94:2108	See WHC-SA-2141			
CONF-9406133-		(1994 American control conference; Baltimore, MD (United States); 29 Jun - 1 Jul 1994)			
2	94:2335	See PNL-SA-23330			
CONF-9406143-		(1. international conference on advanced oxidation technologies for water and air remediation; London (Canada); 25-30 Jun 1994)			
1	94:212	See PNL-SA-24432			
CONF-9406159-		(Integrated risk management: working toward a common process workshop; Albuquerque, NM (United States); 8-10 Jun 1994)			
2	94:734	See WHC-SA-2406			
CONF-9406161-		(Safety analysis working group workshop; Albuquerque, NM (United States); 8-10 Jun 1994)			
4	94:2623	See WHC-SA-2425			

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CONF-9406181-		(Joint Army, Navy, NASA, Air Force environmentally benign cleaning and degreasing technical workshop; Indian Head, MD (United States); 14-15 Jun 1994)			
2	94:707	See SAND-94-1444C			
CONF-9406195-		(NORM 1994: American Chemical Society (ACS) northwest regional meeting; Anchorage, AK (United States); 16-18 Jun 1994)			
1	94:2625	See WHC-SA-2452			
CONF-9406210-		(Health Physics Society annual meeting; San Francisco, CA (United States); 27-30 Jun 1994)			
3	94:736	See WHC-SA-2518			
CONF-9406226-		(DOE integrated workshop from strategic planning to baseline and other objectives; Golden, CO (United States); 1-2 Jun 1994)			
2	94:2080	See PNL-SA-24239			
CONF-9406250-		(Conference on hazardous waste remediation; Bozeman, MT (United States); 8-10 Jun 1994)			
1	94:2381	See ANL/ER/CP-83877			
CONF-9406297-		(1994 annual meeting of the American Nuclear Society (ANS); Stanford, CA (United States); 19-23 Jun 1994)			
1	94:2991	See EGG-M-94071			
CONF-940630-		(11. topical meeting on the technology of fusion energy; New Orleans, LA (United States); 19-24 Jun 1994)			
6	94:2503	See LA-UR-94-1749			
CONF-940632-		(Annual meeting and exhibition of the Air and Waste Management Association; Cincinnati, OH (United States); 19-24 Jun 1994)			
22	94:686	See PNL-SA-23055			
23	94:2029	See FEMP-2314			
24	94:1853	See FEMP-2323			
CONF-940633-		(12. symposium on thermophysical properties; Boulder, CO (United States); 19-24 Jun 1994)			
5	94:642	See LA-UR-94-1452			
CONF-940650-		(19. annual conference and exposition of the National Association of Environmental Professionals (NAEP); global strategies for environmental issues; New Orleans, LA (United States); 12-15 Jun 1994)			
3	94:2083	See RFP-4810			
CONF-9407155-		(Workshop on phytoremediation research needs; Santa Rosa, CA (United States); 24-26 Jul 1994)			
Summ.	94:469	See DOE/EM-0224			
CONF-940738-		(23. DOE/NRC nuclear air cleaning and treatment conference; Buffalo, NY (United States); 25-28 Jul 1994)			
6	94:2112	See WHC-SA-2516			
CONF-940742-		(Computational methods in water resources; Heidelberg (Germany); 19-22 Jul 1994)			
6	94:116	See LBL-35134			
8	94:194	See PNL-SA-23806			
CONF-940744-		(10. international zeolite conference; Garmish-Partenkirchen (Germany); 17-22 Jul 1994)			
4	94:20	See ANL/CMT/CP-82030			
CONF-940748-		(35. annual meeting of the Institute of Nuclear Materials Management (INMM); Naples, FL (United States); 17-20 Jul 1994)			
9	94:259	See WHC-SA-2358			
83	94:2557	See PNL-SA-24739			
98	94:592	See EGG-M-94302			

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CONF-940789-		(American Society of Civil Engineers 1994 National Council on Environmental Engineering (NCEE) conference on critical issues in water and waste water treatment; Boulder, CO (United States); 11-13 Jul 1994)			
1	94:40	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013263	MF-902
CONF-940790-		(10. annual waste testing and quality assurance symposium; Arlington, VA (United States); 11-15 Jul 1994)			
2	94:2551	See PNL-SA-24034			
3	94:2477	See FEMP-2336			
4	94:2594	See UCRL-JC-115886			
5	94:591	See EGG-M-94275			
CONF-940798-		(Radioactive scrap metal conference; Knoxville, TN (United States); 12-14 Jul 1994)			
1	94:1904	See ANL/EA/CP-83307			
CONF-940806-		(6. international congress of ecology: ecological progress to meet the challenge of environmental change; Manchester (United Kingdom); 20-26 Aug 1994)			
1	94:204	See PNL-SA-24222			
CONF-940807-		(9. international symposium on homogeneous catalysis; Jerusalem (Israel); 21-26 Aug 1994)			
1	94:1008	See PNL-SA-23865			
CONF-940808-		(10. international heat transfer conference; Brighton (United Kingdom); 14-18 Aug 1994)			
6	94:1922	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000487	MF-400
CONF-9408110-		(1994 groundwater modeling conference; Fort Collins, CO (United States); 10-13 Aug 1994)			
1	94:41	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014019	MF-903
CONF-9408112-		(10. Oak Ridge model conference on waste management and environment restoration; Oak Ridge, TN (United States); 23-25 Aug 1994)			
1	94:2404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019150	MF-2000
CONF-940812-		(29. intersociety energy conversion engineering conference; Monterey, CA (United States); 7-12 Aug 1994)			
14	94:2374	See ANL/CMT/CP-83184			
CONF-9408124-		(Transportation management annual workshop; Rockville, MD (United States); 8-11 Aug 1994)			
8	94:1091	See WHC-SA-2562			
9	94:2630	See WHC-SA-2569			
10	94:2114	See WHC-SA-2568			
11	94:2115	See WHC-SA-2583			
CONF-9408129-		(DOD database colloquium '94; San Diego, CA (United States); 29-31 Aug 1994)			
2	94:22	See ANL/DIS/CP-83606			
CONF-940813-		(208. American Chemical Society national meeting; Washington, DC (United States); 21-26 Aug 1994)			
2	94:2500	See LA-UR-94-1093			
20	94:2933	See WHC-SA-2480			
23	94:1016	See PNL-SA-24849			
25	94:2629	See WHC-SA-2551			
26	94:1092	See WHC-SA-2563			
27	94:2911	See ANL/CMT/CP-82400			
28	94:1094	See WHC-SA-2584			
29	94:2930	See SAND-94-2380C			
30	94:2910	See ANL/CMT/CP-82152			
31	94:2926	See PNL-SA-23598			
32	94:1093	See WHC-SA-2565			
33	94:219	See PNL-SA-25345			
34	94:2861	See WSRC-MS-94-0590			
35	94:2937	See WSRC-MS-94-0203P			

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CONF-9408136-		(26. Department of Defense explosives safety seminar; Miami, FL (United States); 16-18 Aug 1994)			
3	94:923	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006738	MF-2060
CONF-9408139-		(Transportation management Division workshop; Rockville, MD (United States); 8 Aug 1994)			
1	94:2116	See WHC-SA-2587			
CONF-940815-		(International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994)			
1	94:920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009172	MF-940
5	94:1723	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011467	MF-902
6	94:705	See SAND-94-1003C			
9	94:1081	See WHC-SA-2347			
100	94:2556	See PNL-SA-24319			
101	94:528	See DOE/METC/C-95/7163			
103	94:2550	See PNL-SA-23723			
104	94:2549	See PNL-SA-23718			
105	94:193	See PNL-SA-23775			
106	94:588	See EGG-M-94073			
107	94:1842	See EGG-M-94234			
108	94:1841	See EGG-M-94179			
109	94:3033	See PNL-SA-20950			
110	94:922	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007023	MF-2020
111	94:690	See PNL-SA-23770			
112	94:449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008846	MF-2020
18	94:335	See WSRC-MS-94-0323			
19	94:875	See WSRC-MS-94-0308			
25	94:261	See WHC-SA-2481			
26	94:2627	See WHC-SA-2460			
28	94:498	See DOE/MC/29107-94/C0341			
29	94:1674	See WHC-SP-2332			
32	94:336	See WSRC-MS-94-0327			
37	94:2913	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013827	MF-940
38	94:2914	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013828	MF-900
41	94:733	See WHC-SA-2355			
43	94:447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014104	MF-902; MF-940
45	94:448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014107	MF-902
46	94:2626	See WHC-SA-2453			
48	94:921	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014018	MF-901; MF-940
49	94:1880	See SAND-94-1657C			
52	94:2110	See WHC-SA-2413			
53	94:2624	See WHC-SA-2433			
56	94:1080	See WHC-SA-2335			
59	94:523	See DOE/MC/30171-94/C0344			
60	94:406	See ANL/EA/CP-82126			
61	94:2967	See ANL/CMT/CP-83059			
62	94:415	See ANL/EWM/CP-82955			
63	94:21	See ANL/CMT/CP-82133			
64	94:412	See ANL/ET/CP-82151			
65	94:2373	See ANL/CMT/CP-82156			
66	94:1707	See ANL/CMT/CP-82761			
67	94:416	See ANL/TD/CP-83100			
69	94:2620	See WHC-SA-2317			
70	94:337	See WSRC-MS-94-0341			
72	94:106	See LA-UR-94-2418			
73	94:1865	See LA-UR-94-2664			
75	94:3051	See UCRL-JC-115613			
78	94:695	See PNL-SA-24418			
79	94:687	See PNL-SA-23411			
80	94:216	See PNL-SA-24565			
81	94:1007	See PNL-SA-23850			
82	94:205	See PNL-SA-24297			
83	94:211	See PNL-SA-24403			
84	94:417	See ANL/TD/CP-83149			

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85	94:215	See PNL-SA-24564			
86	94:3041	See PNL-SA-24404			
87	94:688	See PNL-SA-23466			
88	94:1005	See PNL-SA-23112			
89	94:1004	See PNL-SA-22937			
90	94:213	See PNL-SA-24438			
91	94:3040	See PNL-SA-24231			
92	94:2621	See WHC-SA-2337			
94	94:3034	See PNL-SA-23597			
95	94:1013	See PNL-SA-24448			
96	94:2927	See PNL-SA-24320			
97	94:1872	See PNL-SA-24382			
98	94:1875	See PNL-SA-24752			
99	94:206	See PNL-SA-24298			
CONF-9408151-		(Dixy Lee Ray memorial symposium on science-based environmental management; Seattle, WA (United States); 30 Aug - 2 sep 1994)			
1	94:418	See ANL/TD/CP-83736			
2	94:1905	See ANL/EA/CP-83690			
5	94:2376	See ANL/CMT/CP-84043			
CONF-9408153-		(AICHE '94: mixed waste treatment technology development session; Denver, CO (United States); 14-17 Aug 1994)			
1	94:644	See LA-UR-94-2808			
CONF-9408160-		(Small business, USDOE contracts and remediation; Kennewick, WA (United States); 9-12 Aug 1994)			
1	94:2970	See ANL/ITD/CP-83704			
CONF-9408168-		(American Chemical Society symposium on scientific issues related to safety treatment of waste tanks; 208. American Chemical Society national meeting; Atlanta, GA (United States); Washington, DC (United States); 21-26 Aug 1994; 21-26 aug 1994)			
1	94:2629	See WHC-SA-2551			
2	94:1010	See PNL-SA-24027			
3	94:1009	See PNL-SA-23952			
CONF-940853-		(Summer meeting of the American Institute of Chemical Engineers; Denver, CO (United States); 14-17 Aug 1994)			
1	94:421	See BNL-49873			
2	94:914	See ANL/EWM/CP-82897			
3	94:1085	See WHC-SA-2478			
4	94:245	See UCRL-JC-116572			
5	94:397	See ANL/CMT/CP-82121			
6	94:697	See PNL-SA-24694			
7	94:1678	See WSRC-MS-94-0409			
8	94:737	See WHC-SA-2543			
10	94:6	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019323	MF-2000
11	94:1949	See DOE/MC/30168-94/C0348			
13	94:694	See PNL-SA-24289			
CONF-940859-		(5. international symposium on robotics and manufacturing; Maui, HI (United States); 14-18 Aug 1994)			
1	94:2362	See WSRC-MS-94-069			
3	94:2361	See WSRC-MS-94-008			
4	94:640	See LA-UR-94-688			
8	94:2492	See KCP-613-5329			
12	94:2342	See SAND-94-0595C			
14	94:2343	See SAND-94-0596C			
15	94:2327	See LA-UR-94-930			
19	94:2304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012113	MF-906
20	94:2305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012663	MF-906
25	94:2347	See SAND-94-2072C			
26	94:2337	See PNL-SA-24676			
28	94:196	See PNL-SA-23918			
29	94:2336	See PNL-SA-24072			

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CONF-940869-		(9. Institute of Electrical and Electronics Engineers (IEEE) international symposium on intelligent control; Columbus, OH (United States); 16-18 Aug 1994)			
1	94:2341	See SAND-94-0513C			
CONF-940873-		(11. office information technology conference; Chicago, IL (United States); 23-25 Aug 1994)			
3	94:3057	See WHC-SA-2594			
4	94:3043	See PNL-SA-24743			
CONF-940876-		(International Ergonomics Association workshop; Toronto (Canada); 15-19 Aug 1994)			
1	94:641	See LA-UR-94-718			
CONF-940894-		(Annual Ecological Society of America (ESA) meeting: science and public policy; Knoxville, TN (United States); 7-11 Aug 1994)			
	94:376				
CONF-9409162-		(Annual New Mexico water conference; Carlsbad, NM (United States); 30 Sep - 1 oct 1994)			
1	94:2570	See SAND-94-1070C			
CONF-940917-		(3. international conference on heat transfer: advanced computational methods in heat transfer; Southampton (United Kingdom); 5-7 Sep 1994)			
1	94:2348	See SAND-94-2354C			
CONF-9409178-		(American Chemical Society meeting on industrial and engineering chemistry; Atlanta, GA (United States); 19-21 Sep 1994)			
4	94:942	See LA-UR-94-2544			
8	94:1706	See ANL/CMT/CP-82509			
9	94:590	See EGG-M-94273			
11	94:2552	See PNL-SA-24079			
12	94:696	See PNL-SA-24672			
13	94:413	See ANL/ET/CP-82489			
14	94:593	See EGG-M-94401			
15	94:693	See PNL-SA-24093			
CONF-9409187-		(5. AIAA/NASA/USAF/ISSMO symposium on multidisciplinary analysis and optimization conference; Panama City, FL (United States); 7-9 Sep 1994)			
2	94:2085	See SAND-94-0203C			
CONF-9409200-		(Border environmental technology conference; Buffalo, NY (United States); 19-21 Sep 1994)			
1	94:3007	See FEMP-2353			
CONF-9409203-		(Geo-environmental issues facing the Americas; Mayaguez (Puerto Rico); 20 Sep 1994)			
1	94:1881	See SAND-94-2248C			
CONF-9409213-		(Pacific NW Pollution Control Association conference; Spokane, WA (United States); 18-21 Sep 1994)			
1	94:262	See WHC-SA-2640			
CONF-9409215-		(6. Emerging technologies in hazardous waste management; Atlanta, GA (United States); 19-21 Sep 1994)			
1	94:398	See ANL/CMT/CP-82692			
2	94:1079	See WHC-SA-2305			
4	94:400	See ANL/CMT/CP-84751			
CONF-9409217-		(1. international environmental technology and business action conference; Moscow (Russian Federation); 12-16 Sep 1994)			
1	94:3047	See SAND-94-2272C			
CONF-9409219-		(Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994)			
7	94:450	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007008	MF-401
CONF-9409237-		(12. international conference on the properties of water and steam; Washington, DC (United States); Sep 1994)			
1	94:946	See LA-UR-94-3359			

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CONF-9409278-		(GVIS '94: graphics and visualization conference; Richland, WA (United States); 8 Sep 1994)			
1	94:3045	See PNL-SA-24993			
CONF-9409285-		(Federal geographic technology '94; Washington, DC (United States); 27 Sep 1994)			
1	94:451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005389	MF-2070
CONF-9409293-		(5. international conference on database and expert systems applications; Athens (Greece); 7-9 Sep 1994)			
1	94:3038	See PNL-SA-23947			
CONF-9409300-		(Options for land remediation: risk assessment strategies; quality of investigation on technological advances and project financing; London (United Kingdom); 8 Sep 1994)			
1	94:525	See DOE/MC/31185-94/C0347			
CONF-9409328-		(Annual meeting of the North American Association for Environmental Education; Cancun (Mexico); 23-27 Sep 1994)			
1	94:2969	See ANL/EA/CP-85788			
CONF-940983-		(2. international symposium and exhibition on environmental contamination in Central and Eastern Europe; Budapest (Hungary); 20-23 Sep 1994)			
1	94:231	See SAND-94-0996C			
3	94:3048	See SAND-94-2275C			
4	94:414	See ANL/ET/CP-83175			
5	94:1724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006739	MF-2070
CONF-940985-		(American Society for Quality Control Energy and Environmental Quality Division conference; Tucson, AZ (United States); 18-21 Sep 1994)			
6	94:2113	See WHC-SA-2559			
7	94:3013	See LA-UR-94-2694			
CONF-940986-		(Time domain reflectometry in environmental, infrastructure and mining applications symposium; Evanston, IL (United States); 6-7 Sep 1994)			
2	94:1863	See LA-UR-94-981			
3	94:1862	See LA-UR-94-924			
CONF-9410105-		(Institute of Electrical and Electronics Engineers international Carnahan conference on security technology; Albuquerque, NM (United States); 12-14 Oct 1994)			
6	94:105	See LA-UR-94-1946			
CONF-9410147-		(35. ORNL/DOE analytical chemistry in energy technology conference; Gatlinburg, TN (United States); 6-8 Oct 1994)			
3	94:1015	See PNL-SA-24741			
CONF-941015-		(64. annual meeting of the Society of Exploration Geophysicists and international exposition; Los Angeles, CA (United States); 23-27 Oct 1994)			
2	94:452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010299	MF-2020
CONF-941016-		(Materials week '94; Rosemont, IL (United States); 3-7 Oct 1994)			
2	94:698	See PNL-SA-24698			
4	94:1874	See PNL-SA-24683			
CONF-941017-		(4. conference on radiation protection and dosimetry; Orlando, FL (United States); 24-27 Oct 1994)			
5	94:2555	See PNL-SA-24144			

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CONF-9410190-		(18. annual training resources and data exchange conference: meeting line management expectations; Dallas, TX (United States); 31 Oct - 2 nov 1994)			
1	94:3058	See WHC-SA-2657			
CONF-9410209-		(Ground water remediation: existing technology and future direction; Las Vegas, NV (United States); 9-12 Oct 1994)			
	94:371				
CONF-9410230-		(9. annual conference on contaminated soils, analysis, fate, environmental and public health effects, remediation and regulation; Amherst, MA (United States); 17-20 Oct 1994)			
2	94:453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010287	MF-2020
CONF-9410231-		(8. Deneb user group meeting; Detroit, MI (United States); 10-14 Oct 1994)			
1	94:2356	See WHC-SA-2664			
2	94:2338	See PNL-SA-25050			
CONF-9410300-		(18. annual TRADE conference: customer-driven training on line management expectations; Dallas, TX (United States); 31 Oct - 2 nov 1994)			
1	94:2974	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007365	MF-2000
CONF-9410307-		(Facility transitioning, decommissioning and final disposition focus area briefing; Knoxville, TN (United States); 24-25 Oct 1994)			
1	94:2560	See PNL-SA-25177			
CONF-941053-		(International symposium on validation through model testing with experiments; Paris (France); 11-14 Oct 1994)			
1	94:2568	See SAND-94-0599C			
CONF-941061-		(Nuclear science symposium: medical imaging conference; Norfolk, VA (United States); 30 Oct - 5 nov 1994)			
6	94:2505	See LA-UR-94-3637			
CONF-941075-		(18. international symposium on the scientific basis for nuclear waste management; Kyoto (Japan); 23-27 Oct 1994)			
2	94:229	See SAND-94-0805C			
4	94:244	See UCRL-JC-116436			
6	94:1014	See PNL-SA-24498			
CONF-941088-		(Annual meeting of the Geological Society of America; Seattle, WA (United States); 24-27 Oct 1994)			
1	94:2405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005963	MF-2010
CONF-941091-		(25. Project Management Institute annual seminar and symposium; Vancouver (Canada); 17-19 Oct 1994)			
2	94:730	See WHC-SA-2235			
3	94:3037	See PNL-SA-23839			
CONF-941102-		(Winter meeting of the American Nuclear Society; Washington, DC (United States); 13-18 Nov 1994)			
3	94:940	See LA-UR-94-2018			
4	94:939	See LA-UR-94-2017			
5	94:938	See LA-UR-94-2016			
6	94:937	See LA-UR-94-1703			
30	94:2086	See SAND-94-2703C			
33	94:111	See LA-UR-94-3633			
34	94:110	See LA-UR-94-3632			
35	94:3014	See LA-UR-94-3825			
36	94:2050	See LA-UR-94-3724			
37	94:2120	See WHC-SA-2709			
39	94:1012	See PNL-SA-24429			
41	94:399	See ANL/CMT/CP-83588			

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43	94:2928	See PNL-SA-24451			
44	94:2121	See WHC-SA-2729			
Summ.	94:4	See ANL/EA/SUMM-84626			
CONF-9411105-		(40. anniversary conference on bioassay, analytical and environmental radiochemistry; Cincinnati, OH (United States); 15-17 Nov 1994)			
1	94:2478	See FEMP-2387			
4	94:2082	See PNL-SA-24340			
CONF-9411113-		(Conference on development and application of computer techniques to environmental studies: Envirosoft '94; San Francisco, CA (United States); 16-18 Nov 1994)			
2	94:3044	See PNL-SA-24754			
CONF-9411135-		(ASPENWORLD 94; Boston, MA (United States); 6-9 Nov 1994)			
3	94:1082	See WHC-SA-2407			
CONF-9411138-		(30. American Water Resources Association (AWRA) annual conference on water quality; Chicago, IL (United States); 6-10 Nov 1994)			
1	94:42	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001349	MF-2010
CONF-9411139-		(Optimizing the technology transfer function; Chicago, IL (United States); 2-4 Nov 1994)			
1	94:3059	See WHC-SA-2683			
CONF-9411144-		(Optical sensing for environmental and process monitoring; McLean, VA (United States); 7-10 Nov 1994)			
1	94:646	See LA-UR-94-3483			
CONF-9411149-		(Opportunity 95: environmental technology through small business; Morgantown, WV (United States); 16-17 Nov 1994)			
	94:2987	See DOE/METC-95/1014			
1	94:2322	See DOE/MC/29115-95/C0415			
2	94:1954	See DOE/MC/30179-95/C0440			
4	94:2432	See DOE/MC/30358-95/C0432			
5	94:2431	See DOE/MC/30357-95/C0418			
6	94:2986	See DOE/MC/31388-95/C0423			
7	94:513	See DOE/MC/29249-95/C0421			
8	94:2315	See DOE/MC/29104-95/C0436			
9	94:514	See DOE/MC/29467-95/C0426			
10	94:500	See DOE/MC/29107-95/C0413			
11	94:2430	See DOE/MC/29106-95/C0427			
12	94:61	See DOE/MC/30360-95/C0425			
14	94:1955	See DOE/MC/30359-95/C0420			
15	94:56	See DOE/MC/27346-95/C0430			
16	94:1950	See DOE/MC/30171-95/C0434			
17	94:2317	See DOE/MC/29113-95/C0437			
18	94:2323	See DOE/MC/30173-95/C0414			
19	94:1951	See DOE/MC/30172-95/C0433			
20	94:1947	See DOE/MC/30162-95/C0435			
21	94:59	See DOE/MC/29119-95/C0429			
22	94:58	See DOE/MC/29111-95/C0441			
23	94:524	See DOE/MC/30175-95/C0439			
24	94:511	See DOE/MC/29120-95/C0416			
25	94:1836	See DOE/MC/30170-95/C0438			
26	94:501	See DOE/MC/29109-95/C0431			
27	94:510	See DOE/MC/29118-95/C0428			
CONF-9411154-		(Fall meeting of the American Ceramic Society; Columbus, OH (United States); 14-18 Nov 1994)			
1	94:876	See WSRC-MS-94-0569			
CONF-9411156-		(International Atomic Energy Agency (IAEA) technical committee meeting; Vienna (Austria); 21-25 Nov 1994)			
1	94:947	See LA-UR-94-3865			
CONF-9411165-		(2. workshop on residual radioactivity and recycling criteria; Tokai (Japan); 9-11 Nov 1994)			
1	94:1909	See ANL/EA/CP-84292			

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CONF-9411180-		(Air and Waste Management Association annual conference; Eugene, OR (United States); 16-18 Nov 1994)			
1-Vugraphs	94:699	See PNL-SA-25362			
CONF-9411181-		(Earthcare conference; Toulouse (France); 8-10 Nov 1994)			
1	94:2968	See ANL/EA/CP-84367			
CONF-9411183-		(2. tracer workshop; Austin, TX (United States); 14-15 Nov 1994)			
1	94:221	See PNL-SA-25615			
CONF-941124-		(33. Hanford symposium on health and the environment: symposium on in-situ remediation-scientific basis for current and future technologies; Richland, WA (United States); 7-11 Nov 1994)			
1	94:226	See SAND-94-0715C			
2	94:227	See SAND-94-0716C			
3	94:1879	See SAND-94-0676C			
4	94:704	See SAND-94-0786C			
5	94:2622	See WHC-SA-2393			
6	94:731	See WHC-SA-2241			
7	94:260	See WHC-SA-2377			
8	94:1725	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018133	MF-2010
10	94:220	See PNL-SA-25469			
11	94:197	See PNL-SA-24002			
12	94:207	See PNL-SA-24315			
13	94:199	See PNL-SA-24087			
14	94:1873	See PNL-SA-24508			
15	94:217	See PNL-SA-24702			
16	94:198	See PNL-SA-24081			
17	94:202	See PNL-SA-24123			
18	94:203	See PNL-SA-24159			
19	94:218	See PNL-SA-24843			
20	94:1876	See PNL-SA-24899			
21	94:210	See PNL-SA-24388			
22	94:214	See PNL-SA-24505			
CONF-941142-		(American Society of Mechanical Engineers' winter annual meeting; Chicago, IL (United States); 6-11 Nov 1994)			
29	94:1903	See ANL/EA/CP-82216			
CONF-941144-		(Fall meeting of the Materials Research Society; Boston, MA (United States); 28 Nov - 2 dec 1994)			
107	94:2406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008840	MF-2020
120	94:740	See WHC-SA-2675			
122	94:741	See WHC-SA-2676			
58	94:2384	See ANL/IPNS/CP-85110			
CONF-941148-		(ANS meeting on environmental aspects of de-commissioning, decontamination, and/or environmental restoration at nuclear and mixed waste facilities; Washington, DC (United States); 13-17 Nov 1994)			
2	94:1086	See WHC-SA-2504			
3	94:2036	See FEMP-2354			
6	94:2079	See PNL-SA-24036			
CONF-941152-		(Conference and exposition on petroleum hydrocarbons; Houston, TX (United States); 2-4 Nov 1994)			
1	94:2595	See UCRL-JC-118432			
CONF-941196-		(2. ANS workshop on the safety of Soviet-designed nuclear power plants in conjunction with the winter meeting of the American Nuclear Society; Washington, DC (United States); 12-13 Nov 1994)			
2	94:1916	See ANL/EWM/CP-83384			

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CONF-941207-		(Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994)			
9	94:2457	See EGG-M-94222			
16	94:2628	See WHC-SA-2505			
20	94:2407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006386	MF-2000
23	94:2378	See ANL/CMT/CP-84355			
28	94:2481	See INEL-94/00025			
31	94:2377	See ANL/CMT/CP-84354			
33	94:2375	See ANL/CMT/CP-83895			
CONF-941210-		(Power generation conference; Orlando, FL (United States); 7-9 Dec 1994)			
7	94:411	See ANL/ES/CP-85390			
CONF-941214-		(16. US Department of Energy low-level radioactive waste management conference; Phoenix, AZ (United States); 13-15 Dec 1994)			
1	94:112	See LA-UR-94-3685			
2	94:623	See INEL-94/00045			
3	94:2041	See INEL-94/00062			
4	94:454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008781	MF-2020
6	94:625	See INEL-94/00052			
7	94:624	See INEL-94/00051			
CONF-941244-		(System prioritization method workshop; Carlsbad, NM (United States); 8-9 Dec 1994)			
1	94:2408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003738	MF-2000
2-Rev.1	94:2409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003737	MF-2000
Summ.	94:2410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003736	MF-2020
CONF-941245-		(IGT symposium on gas, oil, and environmental biotechnology; Colorado Springs, CO (United States); 12-14 Dec 1994)			
2	94:43	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008678	MF-2000
CONF-941246-		(2. annual EM cost management conference; San Francisco, CA (United States); 5-9 Dec 1994)			
3	94:3008	See FEMP-2394			
6	94:3009	See FEMP-2396			
CONF-941256-		(Winter simulation conference; Orlando, FL (United States); 11-14 Dec 1994)			
1	94:2553	See PNL-SA-24110			
2	94:692	See PNL-SA-23997			
CONF-941265-		(16. DOE annual low-level radioactive waste management conference; Baltimore, MD (United States); 12-15 Dec 1994)			
1	94:622	See INEL-94/00034			
CONF-950159-		(Workshop and symposium on geostatistics for geotechnical and environmental applications; Phoenix, AZ (United States); 26-27 Jan 1995)			
1	94:209	See PNL-SA-24355			
CONF-950163-		(3. international on-site analysis conference; Houston, TX (United States); 22-25 Jan 1995)			
2	94:1100	See WHC-SA-2651			
CONF-950171-		(Efficient Separations and Processing Cross-cutting Program technical exchange meeting; Gaithersburg, MD (United States); 24-26 Jan 1995)			
1	94:2929	See PNL-SA-25549			

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CONF-950209--					
		(4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995)			
2	94:2380	See ANL/ER/CP-83078			
3	94:1952	See DOE/MC/30174-95/C0446			
5	94:44	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009696	MF-2000
6	94:45	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009697	MF-2000
7	94:2371	See ANL/CMT-ACL/CP-83198 (Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995)			
CONF-950216--					
1	94:738	See WHC-SA-2624			
3	94:742	See WHC-SA-2756			
5	94:878	See WSRC-MS-95-0012			
9	94:879	See WSRC-MS-95-0028			
100	94:3	See ANL/EA/CP-85594			
101	94:409	See ANL/EA/CP-85596			
102	94:2	See ANL/EA/CP-84165			
104	94:1907	See ANL/EA/CP-84160			
105	94:1714	See BNL-61426			
106	94:408	See ANL/EA/CP-84360			
107	94:407	See ANL/EA/CP-84163			
108	94:420	See ANL/TD/CP-84268			
109	94:1906	See ANL/EA/CP-84148			
112	94:1104	See WHC-SA-2804			
115	94:2382	See ANL/ER/CP-84530			
116	94:222	See PNL-SA-25864			
117	94:1018	See PNL-SA-25649			
118	94:2589	See SWE-SWB-95-0004			
12	94:2871	See WSRC-RP-95-0040			
120	94:2411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010284	MF-2000
121	94:457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010217	MF-2020
122	94:2122	See WHC-SA-2782			
123	94:2634	See WHC-SA-2772			
124	94:884	See WSRC-TR-95-0039			
125	94:458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010214	MF-2020
126	94:2379	See ANL/EA/CP-85662			
127	94:459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010212	MF-2000
128	94:701	See RFP-4903			
129	94:46	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009693	MF-2010
13	94:2865	See WSRC-MS-95-0010			
131	94:1910	See ANL/EA/CP-85630			
132	94:3050	See SAND-95-0828C			
17	94:2364	See WSRC-MS-94-0658			
18	94:1883	See SAND-95-0070C			
20	94:709	See SAND-94-2564C			
32	94:2631	See WHC-SA-2609			
34	94:2866	See WSRC-MS-95-0057			
35	94:880	See WSRC-MS-95-0056			
37	94:2117	See WHC-SA-2621			
39	94:115	See LA-UR-95-748			
41	94:2051	See LA-UR-95-376			
42	94:649	See LA-UR-95-322			
43	94:113	See LA-UR-95-410			
46	94:949	See LA-UR-95-201			
47	94:2632	See WHC-SA-2625			
48	94:1096	See WHC-SA-2613			
49	94:1097	See WHC-SA-2617			
51	94:2633	See WHC-SA-2628			
53	94:1923	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007617	MF-512
55	94:1099	See WHC-SA-2639			
56	94:499	See DOE/MC/29107-95/C0412			

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57	94:650	See LA-UR-95-346			
58	94:2577	See SAND-94-2266C			
59	94:2579	See SAND-94-2348C			
60	94:713	See SAND-95-0290C			
62	94:1103	See WHC-SA-2696			
64	94:419	See ANL/TD/CP-84267			
65	94:401	See ANL/CMT/CP-85758			
66	94:402	See ANL/CMT/CP-85759			
68	94:424	See BNL-61450			
69	94:2507	See LA-UR-95-174			
73	94:114	See LA-UR-95-698			
74	94:3015	See LA-UR-95-198			
77	94:1885	See SAND-95-0289C			
78	94:2091	See SAND-95-0437C			
79	94:2582	See SAND-95-0436C			
80	94:712	See SAND-95-0172C			
81	94:2559	See PNL-SA-24970			
84	94:1878	See PNL-SA-25672			
85	94:455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009027	MF-2020
86	94:1877	See PNL-SA-24936			
87	94:1857	See INEL-94/00142			
95	94:456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009174	MF-2030
96	94:1854	See FEMP-2370			
99	94:1908	See ANL/EA/CP-84167 (Geoenvironment 2000 meeting; Baton Rouge, LA (United States); 22-24 Feb 1995)			
CONF-950225-					
1	94:243	See UCRL-JC-115345 (6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995)			
CONF-950232-					
1	94:1677	See WSRC-MS-94-0211			
3	94:2363	See WSRC-MS-94-0499			
6	94:2324	See DOE/MC/30362-95/C0405			
7	94:2321	See DOE/MC/29115-95/C0403			
8	94:1101	See WHC-SA-2669			
9	94:589	See EGG-M-94219			
10	94:2306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007379	MF-2060
10	94:2355	See WHC-SA-2627			
11	94:1083	See WHC-SA-2447			
12	94:2354	See WHC-SA-2448			
13	94:1084	See WHC-SA-2449			
15	94:2357	See WHC-SA-2705			
16	94:2314	See DOE/MC/29104-95/C0411			
17	94:2339	See PNL-SA-25159			
20	94:2307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007369	MF-2060
21	94:2308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007035	MF-2060
24	94:2351	See UCRL-JC-117153			
25	94:2352	See UCRL-JC-118890			
26	94:2309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008680	MF-2060
27	94:2310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008684	MF-2060
28	94:2311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008679	MF-2070
29	94:2340	See PNL-SA-25387			
31	94:2312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006391	MF-2060
CONF-950268-		(International conference on radiation protection and radioactive waste management in the mining and minerals industry; No City Given (South Africa); 20 Feb 1995)			
1	94:1726	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007618	MF-512
2	94:1727	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007614	MF-512
3	94:1728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007606	MF-512

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CONF-950269-		(4. annual quality audit conference; Baltimore, MD (United States); 23-24 Feb 1995)			
1	94:1090	See WHC-SA-2549			
CONF-950284-		(1. international workshop on supercritical water oxidation; Jackson, FL (United States); 6-9 Feb 1995)			
1	94:621	See INEL-94/00010			
CONF-950290-		(4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Pittsburgh, PA (United States); 22-24 Feb 1995)			
1	94:2573	See SAND-94-1916C			
CONF-950304-		(Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show; Orlando, FL (United States); 26-31 Mar 1995)			
3	94:1087	See WHC-SA-2539			
6	94:2860	See WSRC-MS-94-0567			
7	94:1102	See WHC-SA-2690			
10	94:1088	See WHC-SA-2540			
11	94:1089	See WHC-SA-2544			
12	94:2119	See WHC-SA-2707			
CONF-9503102-		(Waste management symposia; Tucson, AZ (United States); 1 Mar 1995)			
1	94:718	See UCRL-JC-119133			
2	94:648	See LA-UR-95-90			
CONF-9503116-		(1995 TOUGH workshop; Berkeley, CA (United States); 20-22 Mar 1995)			
2	94:714	See SAND-95-0584C			
3	94:2586	See SAND-95-0568C			
4	94:2587	See SAND-95-0587C			
5	94:2584	See SAND-95-0564C			
6	94:2585	See SAND-95-0565C			
CONF-9503120-		(Instructions for the Hazardous Materials Resources Institute conference; Atlanta, GA (United States); 14-15 Mar 1995)			
1	94:47	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009026	MF-2010
CONF-9504114-		(North American no-dig '95; Toronto (Canada); 30 Apr - 3 May 1995)			
1	94:1882	See SAND-95-0014C			
CONF-9504135-		(5. annual waste-management education and research consortium (WERC) technology development conference; Las Cruces, NM (United States); 18-20 Apr 1995)			
1	94:240	See SAND-95-0574C			
CONF-950420-		(International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 May 1995)			
10	94:1098	See WHC-SA-2618			
12	94:739	See WHC-SA-2666			
CONF-950426-		(3. international conference on nuclear engineering; Kyoto (Japan); 23-27 Apr 1995)			
1	94:2111	See WHC-SA-2491			
CONF-950430-		(5. ANS topical meeting on emergency preparedness and response; Savannah, GA (United States); 18-21 Apr 1995)			
3	94:3061	See WHC-SA-2745			
CONF-950439-		(SMS simulation multiconference: simulation as a critical technology; Phoenix, AZ (United States); 9-13 Apr 1995)			
4	94:2287	See WSRC-MS-94-0595			
12	94:877	See WSRC-MS-94-0662			
CONF-950450-		(8. annual symposium on the application of geophysics to environmental and engineering problems; Orlando, FL (United States); 23-27 Apr 1995)			
1	94:238	See SAND-95-0142C			

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2	94:1884	See SAND-95-0195C			
3	94:239	See SAND-95-0344C			
6	94:2123	See WHC-SA-2784			
CONF-950451-		(21. national environmental symposium and exhibition; San Diego, CA (United States); 17-21 Apr 1995)			
1	94:3049	See SAND-95-0570C			
CONF-950464-		(17. national industrial energy technology conference - serving industry's needs, in conjunction with the spring regional conference of the Gulf Coast Cogeneration Association; Houston, TX (United States); 4-6 Apr 1995)			
1	94:3062	See WHC-SA-2753			
CONF-950483-		(3. international symposium on in situ and on-site bioreclamation; San Diego, CA (United States); 24-27 Apr 1995)			
1	94:232	See SAND-94-1718C			
2	94:48	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010296	MF-402
CONF-9505169-		(International robots and vision automation show and conference; Detroit, MI (United States); 8-11 May 1995)			
2	94:2349	See SAND-95-0610C			
CONF-9505193-		(1995 international conference on robotics and automation; Nagoya (Japan); 21-27 May 1995)			
2	94:2313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008683	MF-2060; MF-2030
CONF-950570-		(International high-level radioactive waste management conference: progress toward understanding; Las Vegas, NV (United States); 1-5 May 1995)			
5	94:2581	See SAND-95-0117C			
7	94:223	See RFP-4900			
10	94:2863	See WSRC-MS-94-0618			
11	94:2864	See WSRC-MS-94-0619			
12	94:2862	See WSRC-MS-94-0617			
CONF-950601-		(Annual meeting of the American Nuclear Society (ANS); Philadelphia, PA (United States); 25-29 Jun 1995)			
4	94:2506	See LA-UR-95-107			
CONF-950646-		(Air and Waste Management Association meeting; San Antonio, TX (United States); 18-23 Jun 1995)			
2	94:263	See WHC-SA-2755			
3	94:708	See SAND-94-2409C			
6	94:2090	See SAND-95-0143C			
11	94:264	See WHC-SA-2810			
CONF-950655-		(35. US symposium on rock mechanics; South Lake Tahoe, NV (United States); 4-7 Jun 1995)			
2	94:2576	See SAND-94-2136C			
3	94:2575	See SAND-94-2134C			
4	94:2578	See SAND-94-2313C			
CONF-950740-		(Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995)			
8	94:2118	See WHC-SA-2633			
1-Rev.1	94:2094	See UCRL-JC-118797-Rev.1			
31	94:2093	See SAND-95-0834C			
32	94:2092	See SAND-95-0759C			
41	94:1679	See WSRC-MS-95-0115			
CONF-950828-		(1995 TOUGH workshop; National heat transfer conference; Berkeley, CA (United States); Portland, OR (United States); 20-22 Mar 1995; 5-9 aug 1995)			
20	94:2585	See SAND-95-0565C			

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DOE-					
0227-2-Rev.1	94:2975	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003991	MF-2000
0252	94:2412	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018688	MF-2000
94016533	94:2976	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016533	MF-902
DOE/AL-					
62350-24F-Attach.3-App.A	94:1741	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018531	MF-2000
DOE/AL/58309-					
55	94:2413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014243	MF-902
56	94:2414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000599	MF-2040
57	94:2415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000809	MF-2040
DOE/AL/62350-					
101	94:1763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003918	MF-2000
104	94:1764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018484	MF-2010
104-Rev.1	94:1765	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001261	MF-2010
108-Rev.1	94:1766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014404	MF-907
110-Rev.1	94:1767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018472	MF-2010
113	94:1768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018460	MF-2010
116	94:1769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003908	MF-2010
120	94:1770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018464	MF-2010
120-Rev.1	94:1771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001259	MF-2010
121F	94:1772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014405	MF-903
125	94:1773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014406	MF-903
127	94:1774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018458	MF-2000
128	94:1775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018482	MF-2000
129-Rev.1	94:1776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009881	MF-2010
12F	94:1733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008757	MF-2000
130	94:1777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009880	MF-2010
132	94:1778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014403	MF-902
132-Rev.1	94:1779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003886	MF-2010
133	94:1780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018480	MF-2000
134	94:1781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003911	MF-2010
135	94:1782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018471	MF-2010
136	94:1783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018479	MF-2000
137	94:1784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018461	MF-2010
137-Rev.1	94:1785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018473	MF-2010
138	94:1786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018462	MF-2010
138-Rev.1	94:1787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018474	MF-2010
139	94:1788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018463	MF-2010

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139-Rev.1	94:1789	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018475	MF- 2010
139-Rev.2	94:1790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018485	MF- 2010
140	94:1791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001264	MF- 2000
141	94:1792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018481	MF- 2000
142	94:1793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001266	MF- 2010
143	94:1794	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001282	MF- 2050
144	94:1795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018477	MF- 2000
145	94:1796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001273	MF- 2010
146	94:1797	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018486	MF- 2010
148	94:1798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018478	MF- 2000
149	94:1799	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003890	MF- 2010
152	94:1800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001270	MF- 2010
152-Rev.1	94:1801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007605	MF- 2010
153	94:1802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003916	MF- 2000
154	94:1803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001274	MF- 2050
155	94:1804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001267	MF- 2010
156	94:1805	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001258	MF- 2010
157	94:1806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001281	MF- 2010
158	94:1807	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001269	MF- 2010
159	94:1808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003891	MF- 2010
159/2/95	94:1809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009461	MF- 2010
15F	94:1734	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008756	MF- 2000
160	94:1810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001280	MF- 2010
161	94:1811	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009833	MF- 2000
162	94:1812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001271	MF- 2010
162(Rev.3/95)	94:1813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009891	MF- 2010
164	94:1814	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001275	MF- 2010
165	94:1815	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001276	MF- 2050
166	94:1816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007613	MF- 2070
167	94:1817	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003912	MF- 2000
168	94:1818	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003913	MF- 2000
169-Rev.1	94:1819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003914	MF- 2010
172	94:1820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009834	MF- 2000

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174-Rev.1	94:1821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007611	MF- 2000
175	94:1822	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007609	MF- 2070
176	94:1823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007612	MF- 2070
17F	94:1735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008763	MF- 2010
181	94:1824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007607	MF- 2000
18F	94:1736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008755	MF- 2000
19F-Rev.3	94:1737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018483	MF- 2000
23F	94:1738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008754	MF- 2010
24F-Attach.2	94:1739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018529	MF- 2010
24F-Attach.3-4	94:1740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018530	MF- 2000
24F-Attach.3-App.B	94:1924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018532	MF- 2010
25F	94:1742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008753	MF- 2000
26	94:1743	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001265	MF- 2010
28	94:1744	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008752	MF- 2000
29	94:1745	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009831	MF- 2070
31F	94:1746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014407	MF-903
3F	94:1729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008758	MF- 2040
41F	94:1747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009830	MF- 2000
43-Rev.1	94:1748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018466	MF- 2010
5-Rev.1	94:1730	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003917	MF- 2000
56-Rev.5	94:1749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003910	MF- 2000
60F-Rev.1	94:1750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001268	MF- 2050
61-Rev.1	94:1751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001278	MF- 2010
64-Rev.1	94:1752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003889	MF- 2010
65	94:1753	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001263	MF- 2010
68F-Rev.3	94:1754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014399	MF-902
71	94:1755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009884	MF- 2000
72D-Rev.1	94:1756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001272	MF- 2010
76-Rev.6	94:1757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003915	MF- 2000
79-Rev.1	94:1758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003909	MF- 2000
7D-Rev.1	94:1731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008760	MF- 2040; MF- 2010
85-Rev.1	94:1759	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007610	MF- 2070
89F-Rev.1	94:1760	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018476	MF- 2040

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8F	94:1732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008761	MF-2040
98	94:1761	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001283	MF-2050
99	94:1762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014400	MF-902
T1	94:1825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018487	MF-2050
T2	94:1826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001260	MF-2010
T3	94:1827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001262	MF-2010
T4	94:1828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003924	MF-2000
T5	94:1829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003925	MF-2000
T6	94:1830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003926	MF-2010
DOE/AL/65779-T1	94:2416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010416	MF-902
DOE/CAO-941046	94:2417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002262	MF-2070
DOE/CH-9303	94:2418	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007920	MF-902
9504	94:460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008771	MF-2000
DOE/CH/10575-T2	94:461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005797	MF-2000
DOE/CH/10618-T1	94:49	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008725	MF-2000
T2	94:7	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010351	MF-2000
DOE/DP/48070-T1	94:2419	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006395	MF-2030
DOE/EA-0339	94:1831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008022	MF-2010
0339-Rev.2	94:1832	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001279	MF-2050
0347-Rev.2	94:1833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003887	MF-2000
0464-Rev.4	94:1834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014398	MF-902
0464-Rev.5	94:1835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003888	MF-2000
0843	94:462	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006841	MF-2000
0984-Draft-B	94:1925	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008216	MF-2050
DOE/EM-0089T-Rev.2	94:463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004428	MF-2020
0109P-Rev.1	94:8	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017314	MF-2010
0140P	94:2977	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008620	MF-900
0148P	94:464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012510	MF-902
0156T	94:2420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014298	MF-900
0163P-Vol.1	94:2421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016045	MF-902; MF-940
0163P-Vol.2	94:2422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016046	MF-902; MF-940
0169P	94:2423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014038	MF-900
0172P	94:465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014933	MF-902
0177-Vol.1	94:924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016636	MF-940
0177-Vol.2	94:925	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016637	MF-940
0177-Vol.3	94:926	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016638	MF-940

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0178	94:1926	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017502	MF-2000
0179	94:1927	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018420	MF-2000
0180	94:1928	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018419	MF-2000
0181	94:1929	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017503	MF-2000
0191P	94:466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018398	MF-2000
0192T	94:467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018616	MF-1000
0193	94:1930	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001710	MF-2000
0194	94:2424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018931	MF-2010
0196	94:2985	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001103	MF-2080
0197	94:1931	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004245	MF-2000
0198	94:1932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004244	MF-2000
0199	94:2425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009364	MF-2000
0200	94:468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002324	MF-2050
0201	94:50	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003293	MF-2010
0202	94:51	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003294	MF-2010
0207	94:1933	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003173	MF-2000
0216	94:1934	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003756	MF-2000
0217	94:1935	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003790	MF-2000
0218	94:1936	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003792	MF-2000
0222	94:1937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003622	MF-2000
0223-Vol.1	94:1938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004505	MF-2000
0223-Vol.2	94:1939	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004506	MF-2000
0224	94:469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006076	MF-2070
0226	94:1940	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004984	MF-2000
0228	94:1941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008736	MF-2000
0232	94:1942	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011575	MF-2000
0232-Vol.1	94:1943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010461	MF-2000
0233	94:1944	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010337	MF-2000
DOE/ER/54235-1	94:470	Massachusetts Institute of Technology, Plasma Fusion Center, Cambridge, Massachusetts 02139			ND-420
DOE/EW/50619-T1	94:9	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007491	MF-2080
DOE/EW/53023-T5-Exec.Summ.	94:2426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010676	MF-902

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DOE/HWP- 130	94:2427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009602	MF- 2080
DOE/ID- 10054(93)	94:2428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002007	MF- 2000
10057(93)	94:471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002025	MF- 2020
10390(94)-Rev.1	94:1945	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001906	MF- 2000
10454	94:2429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002024	MF- 2020
22115	94:55	OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Re- ports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95001913	MF-702
DOE/ID/12584- 179	94:1946	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017287	PC- 2000
DOE/ID/12735- T30	94:472	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014158	MF-902
T31	94:473	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017038	MF-902
T34	94:474	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007651	MF- 2010
DOE/ID/13042- 37	94:475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014144	MF-903
38	94:53	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001650	MF- 2010
39	94:54	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001575	MF- 2010
DOE/ID/13220- T2	94:476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003827	MF- 2000
DOE/LLW- 103-Rev.1	94:477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001911	MF- 2020
114-Rev.1	94:478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004982	MF- 2070
126	94:479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008568	MF- 2070
139	94:480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001927	MF- 2020
157-Rev.1	94:481	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002045	MF- 2020
163-Vol.1	94:482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008609	MF- 2020
163-Vol.2	94:483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008610	MF- 2020
163-Vol.3	94:484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008611	MF- 2020
188	94:485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001978	MF- 2020
195	94:486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008619	MF- 2020
203	94:487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008571	MF- 2020
204	94:488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008567	MF- 2000
205	94:489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003309	MF- 2000
206	94:490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002013	MF- 2020
207	94:491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002014	MF- 2020
212	94:492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002044	MF- 2020

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217	94:493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008570	MF-2000
DOE/MC/27346- 95/C0430	94:56	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007691	MF-2010
DOE/MC/28245- 3909	94:494	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002462	MF-2010
3922	94:495	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006153	MF-2010
DOE/MC/29104- 3662	94:2316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004079	PC-902
95/C0411	94:2314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007349	MF-2060
95/C0436	94:2315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007565	MF-2060
DOE/MC/29105- 3719	94:496	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004107	PC-902
3970	94:497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000054	MF-2020
DOE/MC/29106- 95/C0427	94:2430	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007567	MF-2070
DOE/MC/29107- 94/C0341	94:498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013665	MF-902
95/C0412	94:499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007496	MF-2020
95/C0413	94:500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007568	MF-2020
DOE/MC/29109- 3898	94:502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002509	MF-2000
3977	94:503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006218	MF-2070
3978	94:504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006217	MF-2070
3979	94:505	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006208	MF-2070
95/C0431	94:501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008948	MF-2070; MF-2060
DOE/MC/29110- 3879	94:57	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000004	PC-2010
DOE/MC/29111- 95/C0441	94:58	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008363	MF-2010
DOE/MC/29113- 3766-Pt.1	94:2318	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013208	MF-902
3766-Pt.2	94:2319	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014513	MF-905; MF-902
3912	94:2320	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001479	MF-2070
95/C0437	94:2317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007638	MF-2060
DOE/MC/29115- 95/C0403	94:2321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001589	MF-2060
95/C0415	94:2322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007348	MF-2060
DOE/MC/29116- 3799	94:506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014168	MF-906
3858	94:507	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017588	MF-2070
3913	94:508	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001135	MF-2070

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3956	94:509	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000047	PC-2070
DOE/MC/29118- 95/C0428	94:510	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007970	MF-2020
DOE/MC/29119- 3881	94:60	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000006	PC-2010
95/C0429	94:59	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008362	MF-2070
DOE/MC/29120- 3717	94:512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004105	PC-902
95/C0416	94:511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007498	MF-2010
DOE/MC/29249- 95/C0421	94:513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007495	MF-2020
DOE/MC/29467- 3778	94:515	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004143	MF-107
3779	94:516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018526	MF-2000
3785	94:517	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018528	MF-2000
3807-Pt.2	94:518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015233	MF-902
3877	94:519	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001325	MF-2000
3939	94:520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000033	MF-2000
3952	94:521	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000043	MF-2080; MF-402
3986	94:522	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000063	MF-2000
95/C0426	94:514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007570	MF-2010
DOE/MC/30162- 95/C0435	94:1947	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007974	MF-2000
DOE/MC/30164- 4000	94:1948	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000074	PC-2070
DOE/MC/30168- 94/C0348	94:1949	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000567	MF-2050
DOE/MC/30170- 95/C0438	94:1836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008947	MF-2020
DOE/MC/30171- 94/C0344	94:523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014873	MF-902; MF-940
95/C0434	94:1950	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007694	MF-2000
DOE/MC/30172- 95/C0433	94:1951	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007973	MF-2050
DOE/MC/30173- 95/C0414	94:2323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007971	MF-2020
DOE/MC/30174- 95/C0446	94:1952	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008385	MF-107
DOE/MC/30175- 95/C0439	94:524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008364	MF-2070
DOE/MC/30176- 3937	94:1953	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000030	PC-2070

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DOE/MC/30179- 95/C0440	94:1954	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007692	MF- 2000
DOE/MC/30357- 95/C0418	94:2431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007569	MF- 2070
DOE/MC/30358- 95/C0432	94:2432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007566	MF- 2070
DOE/MC/30359- 3990	94:1956	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000066	PC- 2010
95/C0420	94:1955	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007497	MF- 2050
DOE/MC/30360- 95/C0425	94:61	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007721	MF- 2000
DOE/MC/30362- 95/C0405	94:2324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001590	MF- 2060
DOE/MC/31185- 94/C0347	94:525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007693	MF- 2070
DOE/MC/31388- 95/C0423	94:2986	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007346	MF- 2080
DOE/METC- 95/1014	94:2987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000040	MF- 2000
DOE/METC/C- 95/7163	94:528	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003127	MF- 2010
DOE/MWIP- 5	94:529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000999	MF- 2020
16	94:530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013982	MF-902
17	94:531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014051	MF-940
18	94:532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014572	MF-902; MF-940
20	94:533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015451	MF-902; MF-940
27	94:2434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016453	MF-902
29	94:534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015425	MF-900
30	94:535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003025	MF- 2020
DOE/NTP- 94-1040	94:2435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005221	MF- 2000
94-1041	94:2436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005222	MF- 2000
DOE/NV- 380	94:2437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008214	MF- 2070
381	94:2438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001290	MF- 2010
DOE/OR- 01-1109	94:1837	OSTI; NTIS; GPO Dep.	E 1.99:	DE94009204	MF-902
01-1117/V4	94:1957	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014030	MF-902
01-1158	94:536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003261	MF- 2010
01-1161/V1-D2	94:537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002068	MF- 2010
01-1161/V1-D2/A1	94:538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002055	MF- 2050
01-1167-D2	94:539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019211	MF- 2020
01-1173-D2	94:1958	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000616	MF- 2070

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01-1193-D2	94:540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013603	MF-902
01-1194-D2	94:2439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015940	MF-902
01-1226/V2	94:1959	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014031	MF-902
01-1252-D1	94:62	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015937	MF-902
01-1252-D2	94:63	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000632	MF-2010
01-1258-D2	94:541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004742	MF-2020
01-1268/V1-D1	94:542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001697	MF-2010
01-1268/V2-D1	94:1960	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001698	MF-2010
01-1273/V1-D1	94:1961	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002066	MF-2010
01-1273/V1-D2	94:1962	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009509	MF-2070
01-1273/V2-D1	94:1963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002067	MF-2010
01-1276-D1	94:543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017161	MF-902
01-1276-D2	94:544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001380	MF-2070
01-1282-D1	94:64	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019241	MF-2010
01-1282-D4	94:65	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008652	MF-2010
01-1288-D2	94:545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002301	MF-2010
01-1290-D1	94:546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004745	MF-2070
01-1291-D1	94:547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001381	MF-2020
01-1292-D1	94:1964	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008504	MF-2010
01-1292-D2	94:1965	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005882	MF-2040
01-1311-D1	94:548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001772	MF-2020
01-1311-D2	94:549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004740	MF-2020
01-1312-D1	94:550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002298	MF-2020
01-1312-D2	94:551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008648	MF-2020
01-1313-D1	94:1838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002302	MF-2020
01-1313-D2	94:552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008647	MF-2020
01-1314-D1	94:553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002297	MF-2020
03-1195-D2	94:554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008964	MF-2030
1001/R3	94:10	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014052	MF-902
1047-D2	94:555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004741	MF-2020
2013	94:2440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008871	MF-2000
23701-41.1	94:556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009473	MF-902
DOE/OR/21865-1	94:66	OSTI; NTIS; INIS; U.S. Geological Survey, Books and Open-File Reports, Box 25425, Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95001701	MF-2010
DOE/OR/22028-T15	94:1966	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008331	MF-2000
DOE/OR/22160-T10	94:67	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015049	MF-902

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T12	94:68	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017164	MF-902
T14	94:69	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004858	MF-2020
T15	94:70	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004859	MF-2020
T16	94:71	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007074	MF-2070
DOE/OSTI-					
11680	94:72	OSTI (Free of Charge); INIS		TI94009721	MF-2020
11681	94:73	OSTI (Free of Charge); INIS		TI94009722	MF-2020
11682	94:74	OSTI (Free of Charge); INIS		TI94009723	MF-2000
11683	94:75	OSTI (Free of Charge); INIS		TI94009724	MF-2020
11684	94:557	OSTI (Free of Charge); INIS		TI94009725	MF-2020
3411	94:11	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014096	PC-900
DOE/RL-					
364162-Vol.2	94:584	OSTI		TI95010984	MF-2000
88-30-Rev.4-Vol.1	94:12	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009600	MF-2000
88-30-Rev.4-Vol.2	94:13	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009601	MF-2000
89-03-Rev.2A	94:558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017152	MF-2000
89-12-Rev.2-Draft-A	94:76	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003266	MF-2010
89-28-Rev.2	94:559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004360	MF-2000
90-12-Rev.2	94:560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014246	MF-940
90-21	94:14	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016324	MF-902; MF-940
90-22-Draft-F	94:561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007603	MF-2070
90-28-Rev.3	94:1967	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010194	MF-2050
90-38-Rev.1	94:562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018683	MF-2040
91-19	94:563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017324	MF-2000
91-36-Rev.2	94:2441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005524	MF-902; MF-940
91-46-Draft-D	94:564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007597	MF-2070
91-46-Draft-E	94:565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007598	MF-2020
91-50-Rev.1	94:1968	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006731	MF-2050
92-53-Rev.1	94:1969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003043	MF-2070
92-54-Rev.1	94:1970	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003042	MF-2070
92-61-Rev.2	94:1839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008203	MF-2030
92-63-Rev.2	94:566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007704	MF-2000
93-105	94:79	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014126	MF-903
93-29	94:1971	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015670	MF-940
93-33-Draft-A	94:77	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008218	MF-2010
93-37	94:78	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015330	MF-902
93-54-Draft-A	94:1972	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007600	MF-2070

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93-68-Rev.3	94:567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008694	MF- 2010
93-73	94:568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018686	MF- 2020
93-74-Draft-A-Vol.1	94:1973	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95007705	MF- 2050
93-77	94:2442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017322	MF- 1200
93-79	94:2443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015648	MF-903
93-80	94:1974	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008698	MF- 2070
93-80-Draft-A	94:1975	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009010	MF- 2070
93-81	94:1976	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009565	MF- 2070
93-81-Draft-A	94:1977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008695	MF- 2010
93-82-Draft-A	94:1978	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008696	MF- 2010
93-83	94:1979	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007596	MF- 2070
93-96-Rev.1	94:1980	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007602	MF- 2070
93-98-Rev.1	94:1981	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007601	MF- 2070
93-99	94:2444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015713	MF-902
93-99-Rev.1	94:1982	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007091	MF- 2010
94-05	94:2988	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018163	MF- 2000
94-100-Draft-A	94:2002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007981	MF- 2010
94-101-Draft-A	94:2003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007979	MF- 2010
94-102-Draft-A	94:2004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007980	MF- 2010
94-103-Vol.1	94:580	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008193	MF- 2010
94-103-Vol.2	94:581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008194	MF- 2010
94-103-Vol.3	94:582	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008195	MF- 2010
94-103-Vol.4	94:583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008196	MF- 2010
94-104-Draft-A	94:85	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007977	MF- 2010
94-106	94:2447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004145	MF- 2000
94-106-Rev.1	94:2448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007190	MF- 2000
94-107	94:2005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007976	MF- 2050
94-107-Rev.1	94:2006	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007975	MF- 2050
94-108	94:2007	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007978	MF- 2050
94-112-Draft-A	94:2008	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008180	MF- 2050
94-113	94:2009	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001852	MF- 2050
94-113-Draft-A	94:2010	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008182	MF- 2050
94-12	94:1983	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007962	MF- 2010
94-127	94:2011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002951	MF- 2000

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94-131	94:2012	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009011	MF- 2000
94-131-Draft-A	94:2013	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008181	MF- 2050
94-132-Draft-A	94:86	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008206	MF- 2050
94-135-Draft-A	94:2014	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008205	MF- 2050
94-14	94:2445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010336	MF-902
94-145-Draft-B	94:2015	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008178	MF- 2050
94-151	94:2016	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008183	MF- 2050
94-152	94:2017	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008697	MF- 2050
94-21	94:569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013580	MF-902
94-23	94:80	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015758	MF-902
94-24	94:570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015763	MF-902
94-25	94:571	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015379	MF-902
94-26	94:572	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015378	MF-902
94-29	94:1984	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003269	MF- 2010
94-36-2	94:81	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002950	MF- 2010
94-36-3	94:82	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006800	MF- 2010
94-39	94:2989	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016861	MF-902
94-40	94:573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014244	MF-902
94-42	94:1985	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009555	MF- 2070
94-42-Draft-A	94:1986	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009615	MF- 2070
94-43	94:1987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017333	MF- 2020
94-43-Rev.1	94:1988	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008221	MF- 2050
94-45	94:574	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013579	MF-940
94-46	94:15	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004949	MF- 2050
94-47-Rev.1	94:1989	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008220	MF- 2050
94-48-Draft-A	94:1990	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009009	MF- 2070
94-52	94:927	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018165	MF-940
94-53-Draft-A	94:1991	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008318	MF- 2010
94-55-Rev.1	94:575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009997	MF- 2000
94-59-Draft-A	94:1992	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009557	MF- 2030; MF- 2010
94-61-Draft-A	94:1993	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007967	MF- 2000; MF- 2070
94-62-Draft-A	94:1994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008317	MF- 2000
94-63-Draft-A	94:1995	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007968	MF- 2000
94-64-Draft-A	94:1996	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008219	MF- 2010
94-65-Draft-A	94:1997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008222	MF- 2070; MF- 2050

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94-66-Draft-A	94:1998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008217	MF-2070; MF-2050
94-67-Draft-A	94:1999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008319	MF-2050
94-74	94:2446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019041	MF-2070
94-76	94:83	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004872	MF-2010
94-77	94:84	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019059	MF-2010
94-81	94:576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018167	MF-2000
94-82	94:577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019042	MF-2000
94-89	94:578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016796	MF-2010
94-96	94:2000	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018685	MF-2000
94-97	94:579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001639	MF-2020
94-99-Draft-A	94:2001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007982	MF-2010
95-05	94:2018	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008185	MF-2050
95-24	94:2019	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008179	MF-2050
95-27	94:2020	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008184	MF-2050
DOE/RL/11946- T2-Vol.1	94:2449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019135	MF-2000
T2-Vol.2	94:2450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019136	MF-2000
DOE/SR/18445- T1	94:2990	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005776	MF-2000
DOE/WIPP- 91-005-Rev.4	94:2451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008674	MF-2020
94-006	94:2452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014254	MF-902
94-1020	94:1840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002832	MF-2000
94-2018	94:2453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002831	MF-2000
94-2027	94:2454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002833	MF-2010
EEG- 55	94:2413	See DOE/AL/58309-55			
56	94:2414	See DOE/AL/58309-56			
57	94:2415	See DOE/AL/58309-57			
EGG- 11265-1050	94:2455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016801	MF-2000
11265-1069	94:2021	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019134	MF-2000
11265-3004 2679(93)	94:2456 94:585	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99:	DE94013550 DE94016919	MF-903 PC-902; PC-940
EGG-CEE- 10883	94:586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010710	
EGG-EES- 11478	94:2022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002052	MF-2000
EGG-ER- 11005	94:87	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008601	MF-2070

EGG-GEO-

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EGG-GEO- 10797-Rev.2	94:88	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.	E 1.99:	DE95002006	MF- 2010
EGG-M- 94023	94:2325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005035	MF- 2020
94040	94:587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005020	MF- 2020
94071	94:2991	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005036	MF- 2080
94073	94:588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005025	MF- 2020
94112	94:89	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005030	MF- 2010
94179	94:1841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005037	MF- 2000
94180	94:2992	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005040	MF- 2050
94219	94:589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002046	MF- 2030
94222	94:2457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002010	MF- 2070
94234	94:1842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005018	MF- 2020
94237	94:2458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001902	MF- 2070
94273	94:590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002030	MF- 2070
94275	94:591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005026	MF- 2020
94302	94:592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005024	MF- 2020
94401	94:593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005038	MF- 2020
EGG-MS- 10941	94:594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015316	MF-940; MF-906
11147	94:595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017607	MF- 2020
11211-Vol.1	94:596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017609	MF- 2020
11211-Vol.2	94:597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017610	MF- 2020
11297	94:598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002029	MF- 2000
11303	94:599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000333	MF- 2020
11400	94:600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000332	MF- 2020
11416	94:601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017608	MF- 2050
11420	94:602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002041	MF- 2050
EGG-NRE- 10754	94:2459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002277	MF- 2000
11236	94:2460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015319	MF-940
11451	94:603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002035	MF- 2070
11452	94:604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002005	MF- 2000
11457	94:605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005044	MF- 2050

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EGG-RAAM- 11376	94:2023	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.	E 1.99:	DE95002004	MF-2050
EGG-RWMC- 11189	94:606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015315	MF-940
11190	94:2461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015385	MF-902
EGG-WM- 10774-Rev.2	94:2024	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002039	MF-2000
10877-Rev.1	94:2025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002022	MF-2000
10924	94:2026	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010706	MF-940
10962	94:608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009458	MF-2020
11049	94:609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002018	MF-2010
11053	94:2462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015383	MF-940
11105	94:610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008526	MF-940
11250	94:90	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002050	MF-2010
11342	94:611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001905	MF-2020
11454	94:2463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001951	MF-2000
11467	94:2027	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002019	MF-2000
11479	94:2464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001921	MF-2000
8773	94:607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016278	MF-902; MF-907
EGG-WROC- 11148	94:612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015321	MF-940; MF-902
11152	94:1843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015255	MF-902
EGG-WTD- 10266-Rev.1	94:2465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015269	MF-902
10640	94:613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002048	MF-2020
10651	94:2466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001926	MF-2070
10942	94:1844	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010713	MF-902
10973	94:2467	OSTI; NTIS; GPO Dep.	E 1.99:	DE94010711	MF-940
10981-Vol.1	94:1845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002027	MF-2020
10981-Vol.2	94:1846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002028	MF-2020
11136	94:2468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001916	MF-2000
11137	94:614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002047	MF-2020
11138	94:1847	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001977	MF-2000
11156	94:615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001904	MF-2000
11161	94:2469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015265	MF-901; MF-902
11185	94:1848	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001390	MF-2060
11191	94:1849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015384	MF-902; MF-940
11199	94:616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015260	MF-940
11208	94:1850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015289	MF-906
11216	94:2470	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002034	MF-2000
11252	94:2993	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002031	MF-2080

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11252-Vol.1	94:2994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002011	MF-2080
11271	94:617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015261	MF-940
11310	94:928	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015294	MF-902; MF-906
11311	94:929	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015293	MF-940
11403	94:618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002036	MF-2000
11424	94:1851	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002008	MF-2070
11446	94:2326	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004997	MF-2020
ES/ER/TM-102/R1	94:2471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004874	MF-2070
104	94:2997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002295	MF-2050
113	94:2998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004739	MF-2000
120/V1	94:2999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001384	MF-2000
120/V2	94:3000	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001385	MF-2000
120/V3	94:3001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001386	MF-2000
123	94:2472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004744	MF-2070
131	94:619	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002304	MF-2010
136	94:620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003903	MF-2000
146	94:2473	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009998	MF-2000
35/R1	94:2028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008097	MF-2000
56/V1	94:2995	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019214	MF-2000
56/V2	94:2996	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019215	MF-2000
ES/ESH-20	94:91	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018334	MF-2010
50	94:3002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006673	MF-2000
51	94:3003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006672	MF-2000
53	94:3004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006635	MF-2000
54	94:3005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006671	MF-2000
ESD-4290	94:148	See ORNL/TM-12772			
ESTSC-000675IBMMF00	94:3006	ESTSC			
000766AL00000	94:2474	ESTSC			
000808IB38600	94:92	ESTSC			
FEMP-2303	94:2475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016581	MF-902; MF-940
2314	94:2029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015812	MF-900
2318	94:2030	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015807	MF-940
2320	94:2031	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015808	MF-940
2322	94:1852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016580	MF-902; MF-940
2323	94:1853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016579	MF-902; MF-940
2324	94:2032	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015814	MF-940
2326	94:2033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016582	MF-940

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2329	94:2476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015810	MF-907
2330	94:2034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015813	MF-902
2336	94:2477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018443	MF-2000
2342	94:2035	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018423	MF-2000
2353	94:3007	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018444	MF-2000
2354	94:2036	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003027	MF-2050
2370	94:1854	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009117	MF-2070
2387	94:2478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003028	MF-2000
2394	94:3008	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004943	MF-2050
2396	94:3009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004945	MF-2050
FEMP/SUB- 058	94:93	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018442	MF-2010
084	94:2037	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012501	MF-900
GJ/TMC- 01-Ed.3	94:1946	See DOE/ID/12584-179			
HLW-OVP- 94-0005	94:930	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016435	MF-940
IAEA-SR- 189-35	94:703	See SAND-94-0495C			
ICF- 0001	94:3010	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001294	MF-2000
INEL- 94/0001	94:1855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008673	MF-2020
94/00010	94:621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008607	MF-2020
94/00025	94:2481	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008614	MF-2070
94/0003	94:2479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008621	MF-2000
94/00034	94:622	OSTI; NTIS; INIS		TI95008605	
94/0004	94:1856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008622	MF-2020
94/00045	94:623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008606	MF-2000
94/00051	94:624	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008617	MF-2020
94/00052	94:625	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008616	MF-2020
94/00062	94:2041	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008604	MF-2000
94/0010	94:2039	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008558	MF-2050
94/0014	94:2480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008577	MF-2000
94/00142	94:1857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008613	MF-2020
94/0030	94:2482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008563	MF-2000
94/0059	94:2040	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008555	MF-2000
94/0071	94:626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008564	MF-2000
94/0105	94:2483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008560	MF-2070
94/0106	94:2484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008691	MF-2070

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94/0109	94:2485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008561	MF-2070
94/0139	94:2042	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008672	PC-2050
94/0159	94:627	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008569	MF-2070
94/0173	94:1858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008667	MF-2060; MF-2020
94/0203	94:2486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008556	MF-2010
94/0205	94:3011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008669	MF-2000
94/0210	94:628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008574	MF-2060
94/0223	94:629	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008572	MF-2020
94/0236	94:2043	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008575	MF-2000
94/0252	94:2044	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008566	MF-2070
94/0253	94:630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008599	MF-2020
95/0001	94:2045	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008659	MF-2000
95/0039	94:1859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008671	MF-2020
INEL/MISC--					
92024	94:480	See DOE/LLW-139			
94052	94:2428	See DOE/ID-10054(93)			
94058	94:490	See DOE/LLW-206			
94059	94:491	See DOE/LLW-207			
94060	94:477	See DOE/LLW-103-Rev.1			
94062	94:485	See DOE/LLW-188			
94063	94:2429	See DOE/ID-10454			
94064	94:492	See DOE/LLW-212			
94087	94:487	See DOE/LLW-203			
IS--					
5090	94:2489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014239	MF-906; MF-902
5111	94:2490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010235	MF-940
5116	94:2491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010269	MF-2000
K/EM--					
67	94:631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017183	MF-902
K/TCDD--					
1111	94:632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016531	MF-902
KCP--					
613-5329	94:2492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008707	MF-940
613-5423	94:706	See SAND-94-1119C			
613-5462	94:707	See SAND-94-1444C			
KY/ERWM--					
18	94:3004	See ES/ESH-53			
19	94:3005	See ES/ESH-54			
LA--					
12654-Rev.	94:931	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017687	PC-2030
12733-MS-Vol.1	94:94	OSTI; NTIS; GPO Dep.	E 1.99:	DE94010685	MF-903
12733-MS-Vol.2	94:95	OSTI; NTIS; GPO Dep.	E 1.99:	DE94010686	MF-903
12752-MS	94:633	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005743	MF-2070
12753-MS	94:634	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005742	MF-2070
12764-ENV	94:635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016643	MF-902
12782-MS	94:2493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014138	MF-902
12783-MS	94:636	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013643	MF-903; MF-902

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12789-MS	94:637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013199	MF-940
12799-PR	94:96	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013979	MF-940
12821-MS	94:2494	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006856	MF-2070
12831-MS	94:97	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006074	MF-2010
12857-ENV	94:2049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005744	MF-2070
12861-MS	94:98	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004230	MF-2000
12863	94:932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005652	PC-2070
12865	94:2495	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002454	MF-2000
12883-MS	94:99	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007637	MF-2000
12889	94:933	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005651	PC-2070
LA-SUB--					
94-101	94:2497	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017053	MF-903
94-116	94:638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019171	MF-2020
94-139	94:1861	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001749	MF-2040
94-154	94:102	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003457	MF-2000
94-17	94:3012	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015420	MF-900
94-18	94:100	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019164	MF-2010
94-84	94:2496	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013612	MF-903
94-88	94:101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015419	MF-902; MF-940
95-4	94:639	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005730	MF-2020
95-7	94:934	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005734	MF-2030
95-25	94:103	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007641	MF-2000
95-26	94:104	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007642	MF-2070
95-28	94:2915	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007643	MF-2030
95-30	94:2498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007645	MF-2000
95-35	94:935	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010801	MF-2030
LA-UR--					
94-1093	94:2500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009326	MF-701
94-1452	94:642	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014717	MF-903; MF-940
94-1510	94:2501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003754	MF-940
94-1544	94:2502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018613	MF-2070
94-1658	94:936	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013001	MF-940
94-1703	94:937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014812	MF-940
94-1735	94:1864	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012926	MF-902; MF-940
94-1749	94:2503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012904	MF-940
94-1946	94:105	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014435	MF-940
94-2016	94:938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014295	MF-940
94-2017	94:939	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014294	MF-940
94-2018	94:940	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014290	MF-940
94-2019	94:941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014291	MF-940
94-2110	94:643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014482	MF-940
94-228	94:2499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003752	MF-2000
94-2418	94:106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016292	MF-940

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94-2544	94:942	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018089	MF-2030
94-2664	94:1865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016188	MF-940
94-2691	94:2504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018075	MF-2000
94-2694	94:3013	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018076	MF-2000
94-2808	94:644	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018290	MF-2020
94-2830	94:107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018286	MF-2010
94-2880	94:645	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018296	MF-2010
94-3077	94:943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000872	MF-2030
94-3114	94:108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006448	MF-2010
94-3120	94:109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006449	MF-2010
94-3121	94:1866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006447	MF-2020
94-3195	94:944	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000912	MF-2030
94-3196	94:1867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000911	MF-2040
94-3233	94:945	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000937	MF-2000
94-3252	94:1868	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000941	MF-2040
94-3359	94:946	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001020	MF-2030
94-3483	94:646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002717	MF-2010
94-3632	94:110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002731	MF-2050
94-3633	94:111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002730	MF-2000
94-3637	94:2505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002729	MF-2000
94-3685	94:112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002699	MF-2020
94-3724	94:2050	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003719	MF-940
94-3825	94:3014	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003690	
94-3865	94:947	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003698	MF-2030
94-4316	94:647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005254	MF-2000
94-688	94:640	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007556	MF-902
94-718	94:641	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009306	MF-940
94-924	94:1862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009359	MF-903
94-930	94:2327	OSTI; NTIS; GPO Dep.	E 1.99:	DE94009361	MF-906
94-981	94:1863	OSTI; NTIS; GPO Dep.	E 1.99:	DE94009347	MF-903
95-107	94:2506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006297	MF-2000
95-1164	94:651	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010888	
95-174	94:2507	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007869	MF-2000
95-198	94:3015	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006326	MF-2080
95-201	94:949	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006264	MF-2000
95-212	94:3016	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006292	MF-2000
95-322	94:649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006280	MF-2020
95-346	94:650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006273	MF-2020

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95-376	94:2051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006282	MF-2070
95-381	94:2052	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006289	MF-2000
95-410	94:113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006286	MF-2020
95-698	94:114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007849	MF-2010
95-748	94:115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007832	MF-2000
95-78	94:948	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006335	MF-2030
95-90	94:648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006334	MF-2020
LBL-					
34468	94:3017	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006725	MF-2000
35134	94:116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011352	MF-802
35186	94:117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011350	MF-810
35312	94:118	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011010	MF-800
35384	94:2508	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011624	PC-902
35569	94:119	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006581	MF-2010
36086	94:120	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; GPO Dep.	E 1.99:	DE95004816	MF-2010
36088	94:121	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004817	MF-2010
36211	94:3018	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006719	MF-2000
36212	94:3019	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006727	MF-2010
36385	94:3020	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006722	MF-2010
36779	94:3021	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009376	MF-2010
36780	94:3022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009377	MF-2010
LBL-PUB-					
5353-Rev.1	94:652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008501	MF-2000
5354-Rev.1	94:653	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008502	MF-2020
ORNL-					
6769	94:654	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006204	MF-902
6826	94:655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010051	MF-2000
6844	94:2053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008965	MF-2050
6846	94:2054	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004996	MF-2050
ORNL/ER-					
120	94:2509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000442	MF-2000
152	94:131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001869	MF-2000
167	94:2055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019209	MF-2000
169/S3	94:132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004733	MF-2010
171-D2	94:539	See DOE/OR-01-1167-D2			
190	94:536	See DOE/OR-01-1158			
191-D2	94:2439	See DOE/OR-01-1194-D2			
193-D2	94:554	See DOE/OR-03-1195-D2			
201	94:133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002305	MF-2010
202	94:134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015939	MF-902

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213/R1	94:135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002294	MF- 2010
216	94:2056	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008555	MF-902
218	94:657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014029	MF-902
22	94:122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003257	MF- 2010
221-D1	94:62	See DOE/OR-01-1252-D1			
221-D2	94:63	See DOE/OR-01-1252-D2			
224-D2	94:545	See DOE/OR-01-1288-D2			
226	94:2057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003988	MF- 2000
234	94:658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018406	MF- 2000
235	94:2058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002308	MF- 2010
237	94:136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003260	MF- 2010
239	94:2059	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018409	MF- 2050
241	94:2060	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018397	MF- 2000
242-D1	94:543	See DOE/OR-01-1276-D1			
242-D2	94:544	See DOE/OR-01-1276-D2			
244-D1	94:64	See DOE/OR-01-1282-D1			
244-D4	94:65	See DOE/OR-01-1282-D4			
250	94:546	See DOE/OR-01-1290-D1			
251-D1	94:1964	See DOE/OR-01-1292-D1			
251-D2	94:1965	See DOE/OR-01-1292-D2			
252-D1	94:547	See DOE/OR-01-1291-D1			
253	94:553	See DOE/OR-01-1314-D1			
26	94:123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002290	MF- 2010
261	94:137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003901	MF- 2010
264	94:138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004730	MF- 2070
268	94:139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003902	MF- 2010
269	94:140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003971	MF- 2070
270-D1	94:548	See DOE/OR-01-1311-D1			
270-D2	94:549	See DOE/OR-01-1311-D2			
273-D1	94:550	See DOE/OR-01-1312-D1			
273-D2	94:551	See DOE/OR-01-1312-D2			
274-D1	94:1838	See DOE/OR-01-1313-D1			
274-D2	94:552	See DOE/OR-01-1313-D2			
275	94:659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003972	MF- 2030
280	94:2061	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009999	MF- 2050
281	94:141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005735	MF- 2010
282	94:2062	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003970	MF- 2000
283	94:142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003968	MF- 2010
286	94:950	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005736	MF- 2030
288	94:2063	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010052	MF- 2000
290	94:143	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010053	MF- 2070
291	94:2510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005693	MF- 2070
57	94:656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003262	MF- 2000
68	94:124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002289	MF- 2010

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69	94:125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002291	MF-2010
70	94:126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003263	MF-2010
71	94:127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003048	MF-2010
72	94:128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002307	MF-2010
73	94:129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002288	MF-2010
74	94:130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002292	MF-2010
ORNL/ER/Sub- 87-99053/28	94:660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004736	MF-2020
87-99053/43	94:656	See ORNL/ER-57			
87-99053/54	94:144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019210	MF-2010
87-99053/71	94:951	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019213	MF-2030
87-99053/72	94:2064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018405	MF-2000
87-99053/73	94:2065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019249	MF-902
92-SK263/1-Rev.2	94:661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008650	MF-2000
ORNL/GWPO- 005	94:145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013983	MF-902
011	94:146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009658	MF-2010; MF-2070
ORNL/M- 2553	94:1837	See DOE/OR-01-1109			
2751/V1/Pt.B	94:662	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016145	MF-902
2751/V3/Pt.A	94:663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016167	MF-902
2751/V3/Pt.B	94:664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016168	MF-902
2751/V3/Pt.C	94:665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93016169	MF-902
3028	94:540	See DOE/OR-01-1193-D2			
3094	94:1957	See DOE/OR-01-1117/V4			
3174	94:10	See DOE/OR-1001/R3			
3574	94:1959	See DOE/OR-01-1226/V2			
3609	94:533	See DOE/MWIP-20			
3640	94:530	See DOE/MWIP-16			
3641	94:531	See DOE/MWIP-17			
3642	94:532	See DOE/MWIP-18			
3656	94:145	See ORNL/GWPO-005			
3691	94:534	See DOE/MWIP-29			
3763	94:2511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018408	MF-2000
3778	94:529	See DOE/MWIP-5			
3805	94:541	See DOE/OR-01-1258-D2			
3964	94:555	See DOE/OR-1047-D2			
4105	94:146	See ORNL/GWPO-011			
4156	94:3023	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009041	MF-2000
ORNL/RASA- 94/2	94:2512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016319	MF-902
ORNL/TM- 11250	94:666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017422	MF-2020
11642	94:667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017647	MF-510
12245	94:952	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006795	MF-2030
12250	94:668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004221	MF-2000
12390	94:2066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010688	MF-2050
12631	94:953	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006492	MF-2020

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12660	94:954	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007315	MF-902; MF-940
12710	94:2328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015635	MF-902; MF-906
12714	94:2329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013196	MF-902
12724	94:3024	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017591	MF- 2000
12751	94:2330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013406	MF-940
12759	94:2513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015934	MF-902
12760	94:147	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017316	MF- 2000
12765	94:669	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017531	PC-510
12768	94:670	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001000	MF- 2030
12770	94:2331	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015010	MF-902
12772	94:148	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002442	MF- 2010
12774	94:3025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002507	MF- 2000
12781	94:955	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000424	MF- 2030
12785	94:2916	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002059	MF- 2030
12786	94:671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002441	MF- 2020
12792	94:2514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002512	MF- 2020
12800	94:956	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017660	MF- 2010
12823	94:2917	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005997	MF- 2000
12825	94:149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002841	MF- 2020
12828	94:672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004734	MF- 2020
12848	94:673	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007124	MF- 2020
12876	94:674	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006797	MF- 2030
12899	94:675	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010811	MF- 2000
12900	94:2070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009063	MF- 2020
12906	94:2071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008657	MF- 2000
12908	94:676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009657	MF- 2020
12910	94:150	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009926	MF- 2070
12931	94:151	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008106	
PATENTS-US- A7917243	94:2519	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016133	MF- 1380
A7933153	94:2520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016119	MF-940
A7934394	94:677	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016108	MF-706
A7935950	94:152	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016105	MF-702
A8012864	94:153	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009966	MF-702
A8036581	94:2332	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009984	MF-706
PATENTS-U.S.- 4,208,377/A	94:2966	Patent and Trademark Office, Box 9, Washing- ton, DC 20232 (United States)			
4,574,072/A	94:2965	Patent and Trademark Office, Box 9, Washing- ton, DC 20232 (United States)			
4,771,006/A	94:2903	Patent and Trademark Office, Box 9, Washing- ton, DC 20232 (United States)			
4,781,458/A	94:1702	Patent and Trademark Office, Box 9, Washing- ton, DC 20232 (United States)			

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4,832,122/A/	94:394	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
4,835,107/A/	94:2964	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
4,919,190/A/	94:2367	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
4,993,139/A/	94:2366	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,039,224/A/	94:2902	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,316,411/A/	94:2901	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,318,751/A/	94:392	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,324,661/A/	94:393	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,325,918/A/	94:389	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,326,703/A/	94:390	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,330,291/A/	94:391	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,339,694/A/	94:388	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,344,623/A/	94:2962	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,345,034/A/	94:387	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,346,618/A/	94:2963	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,366,634/A/	94:913	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,372,391/A/	94:2900	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,384,048/A/	94:386	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
5,409,678/A/	94:2961	Patent and Trademark Office, Box 9, Washington, DC 20232 (United States)			
PB-					
94-173093/XAB	94:2521	NTIS Prices: PC A14/MF A03			
PNL-					
10050	94:968	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017396	MF-2030
10053	94:2530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003799	MF-2010
10058	94:969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017781	MF-2030
10060	94:160	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004387	MF-2070
10061	94:2531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002582	MF-2000
10062	94:3030	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018618	MF-2000
10064	94:970	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001159	MF-2030
10067	94:971	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018404	MF-2030
10074	94:972	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000426	MF-2030
10075	94:973	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018619	MF-2030
10078	94:2920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018620	MF-2030
10079	94:161	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000976	MF-2030
10081	94:162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004275	MF-2030

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10082	94:163	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002318	MF- 2010
10091	94:974	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000769	MF- 2030
10092-Rev.2 10094	94:1839 94:164	See DOE/RL-92-61-Rev.2 OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000978	MF- 2010
10095	94:975	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001158	MF- 2030
10098	94:681	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000825	MF- 2020
10099	94:976	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001660	MF- 2070
10100	94:977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001311	MF- 2070
10101	94:978	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001659	MF- 2070
10105	94:979	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000770	MF- 2030
10107	94:980	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002853	MF- 2030
10109 10112	94:165 94:166	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99:	DE95000975 DE95000771	MF-510 MF- 2000
10120	94:167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000773	MF- 2030
10123	94:168	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003174	MF- 2010
10126	94:2532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003800	MF- 2030
10127	94:981	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001661	MF- 2030
10128	94:982	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001658	MF- 2030
10130	94:983	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000898	MF- 2030
10131	94:1869	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002854	MF- 2030
10132 10133	94:2009 94:2073	See DOE/RL-94-113 OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001854	MF- 2000
10134	94:984	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005754	MF- 2030
10137-Rev.1	94:2533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001160	MF- 2000
10138	94:985	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001790	MF- 2030
10146	94:682	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002845	MF- 2000
10147	94:683	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001484	MF- 2010
10150	94:986	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001923	MF- 2070
10153	94:987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001157	MF- 2030
10158	94:169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001922	MF- 2010
10160	94:988	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002855	MF- 2030
10161	94:989	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004359	MF- 2030
10163	94:990	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004226	MF- 2030
10164 10166	94:1870 94:170	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99:	DE95000831 DE95007633	MF-721 MF- 2010

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10168	94:684	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002320	MF-2070
10170	94:171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004986	MF-2030
10170-Reissue	94:172	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007634	MF-2030
10171	94:173	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004276	MF-2000
10172	94:991	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002583	MF-2030
10173	94:992	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002322	MF-2030
10175	94:993	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008920	MF-2030
10176	94:994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002585	MF-606
10182	94:174	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001855	MF-2010
10184	94:175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002856	MF-2010
10185	94:995	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006367	MF-2030
10187	94:2921	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007954	MF-2030
10189	94:996	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003175	MF-2030
10191	94:2534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004246	MF-510
10194	94:176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005752	MF-2010
10196	94:177	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004987	MF-2010
10198	94:997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003176	MF-2030
10204	94:3031	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011334	MF-2000
10208	94:178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003803	MF-2030
10209	94:179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004277	MF-2030
10210	94:2535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005062	MF-2020
10240	94:180	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004278	MF-2030
10249	94:2074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005438	MF-2000
10260	94:2075	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006239	MF-2000
10275	94:181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004714	MF-2010
10281	94:2536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004988	MF-2000
10283	94:2922	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006368	MF-2030
10285	94:182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008084	MF-2010
10359-Vol.1	94:2537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007952	MF-2020
10359-Vol.2	94:2538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007953	MF-2020
10370	94:998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005398	MF-2030
10379	94:183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008921	MF-2020
10398-Vol.1	94:2539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006193	MF-2050
10398-Vol.2	94:2540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006194	MF-2050

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10400-Draft	94:16	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006489	MF-2010
10415	94:2076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006370	MF-2010
10417	94:2923	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007951	MF-2030
10422	94:184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008896	MF-2070
10423	94:185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007635	MF-2010
10459	94:3032	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008085	MF-2000
10474	94:2077	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008492	MF-2070
10476	94:685	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008625	MF-2020
10483	94:186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010548	MF-2010
10484	94:187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010407	MF-2010
10485	94:1871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010204	MF-2020
10486	94:2924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008626	MF-2030
10490	94:999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008627	MF-2030
10497	94:2541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010324	MF-510
10503	94:1000	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009570	MF-2030
10508	94:188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010323	MF-2010
10512	94:1001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010325	MF-2030
10535	94:189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011670	MF-2010
10544	94:190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011502	MF-2010
6415-Rev.6	94:2333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018726	MF-2000
7722-Rev.2	94:463	See DOE/EM-0089T-Rev.2			
8900	94:957	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003006	MF-510
8901	94:958	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004358	MF-2030
8902	94:2522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011438	MF-902
8955	94:678	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000839	MF-2020
8996	94:2523	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014992	MF-900
9053	94:959	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008667	MF-721
9335	94:154	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008732	MF-902
9336	94:2524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013454	MF-902
9387	94:2918	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008235	MF-940
9409	94:960	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013977	MF-902; MF-940
9411	94:155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011403	MF-902
9412	94:156	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011138	MF-902
9424	94:157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001462	MF-2010
9429	94:2989	See DOE/RL-94-39			
9434-Rev.1	94:961	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007523	MF-2030
9446	94:962	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011434	MF-906
9450-1	94:3027	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018005	MF-2000
9744	94:679	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015162	MF-940
9746	94:680	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019084	MF-2020
9785	94:2072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007264	MF-2070

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9787	94:2525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017392	MF-2030
9791	94:158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013959	MF-603
9803-Rev.1	94:575	See DOE/RL-94-55-Rev.1			
9814	94:963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013958	MF-940
9814-Rev.1	94:964	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018733	MF-2030
9814-Rev.2	94:965	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009410	MF-2030
9821	94:2526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015194	MF-940
9822	94:2527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019131	MF-2030
9823	94:3028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000320	MF-2000
9824	94:3029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000319	MF-2000
9874	94:2528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000317	MF-721
9959	94:966	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016420	MF-940
9978	94:967	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017466	MF-2030
9984	94:2919	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016418	MF-940
9986	94:159	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016417	MF-902
9998	94:2529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017780	MF-2030
PNL-SA-20502	94:2078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004899	MF-2020
20933	94:1002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004931	MF-2030
20950	94:3033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005402	MF-2000
21389	94:2925	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003145	MF-2030
21497	94:1003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004561	MF-2030
22803	94:191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008734	MF-403
22937	94:1004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017797	MF-2030
22987	94:2334	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012503	MF-900
23055	94:686	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014995	MF-902
23112	94:1005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017799	MF-2030
23186	94:2542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014558	MF-940
23330	94:2335	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015000	MF-906
23384	94:2543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015286	MF-940
23386	94:2544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019190	MF-2000
23411	94:687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017476	MF-2020
23453	94:2545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019191	MF-2030
23454	94:2546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015273	MF-940
23466	94:688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017795	MF-2020
23487	94:2547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015212	MF-940
23488	94:2548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014571	MF-901; MF-940
23597	94:3034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018719	MF-2000
23598	94:2926	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003146	MF-2030
23687	94:3035	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001431	MF-2000
23718	94:2549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004900	MF-2030
23722	94:192	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014411	MF-908
23723	94:2550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004578	MF-2000

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23742	94:689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012244	MF-940
23770	94:690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007800	MF-2020
23775	94:193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004940	MF-2070
23788	94:3036	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014555	MF-900
23790	94:1006	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014496	MF-906;
23806	94:194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017461	MF-940
23839	94:3037	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004572	MF-2010
23850	94:1007	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017460	MF-402
23865	94:1008	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018724	MF-2030
23882	94:195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017459	MF-2070
23918	94:196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003153	MF-2060
23947	94:3038	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007268	MF-2000
23952	94:1009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004957	MF-2030
23972	94:691	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013321	MF-902
23997	94:692	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007155	MF-2000
24002	94:197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007167	MF-2000
24027	94:1010	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004559	MF-2030
24034	94:2551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015944	MF-940
24036	94:2079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007281	MF-2050
24065	94:1011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014498	MF-940
24072	94:2336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004898	MF-2060
24079	94:2552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003148	MF-2000
24081	94:198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007283	MF-2010
24087	94:199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007267	MF-2010
24093	94:693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005403	MF-2020
24094	94:200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013325	MF-906
24110	94:2553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007166	MF-2010
24120	94:201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016987	MF-902
24123	94:202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007280	MF-2010
24139	94:2554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013324	MF-940
24144	94:2555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004564	MF-2070
24157	94:3039	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014494	MF-903
24159	94:203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007756	MF-2040
24222	94:204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004902	MF-2030
24231	94:3040	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017803	MF-2010
24239	94:2080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004972	MF-2010
24285	94:2081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019189	MF-2070
24289	94:694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004932	MF-2020

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24297	94:205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017464	MF- 2070
24298	94:206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019186	MF- 2010
24315	94:207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007159	MF- 2000
24319	94:2556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019104	MF- 2020
24320	94:2927	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018918	MF- 2030
24336	94:208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014445	MF-903
24340	94:2082	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007160	MF- 2000
24355	94:209	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007161	MF- 2000
24382	94:1872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018915	MF- 2000
24388	94:210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007816	MF- 2020
24403	94:211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017479	MF- 2010
24404	94:3041	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017456	MF- 2000
24418	94:695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017480	MF- 2020
24419	94:3042	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015205	MF-902
24429	94:1012	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007797	MF- 2030
24432	94:212	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015207	MF-502; MF-506
24438	94:213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017798	MF- 2010
24448	94:1013	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018917	MF- 2030
24451	94:2928	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007810	MF- 2010
24498	94:1014	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003152	MF- 2030
24505	94:214	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007812	MF- 2010
24508	94:1873	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007285	MF- 2040
24564	94:215	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017455	MF- 2010
24565	94:216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017457	MF- 2010
24672	94:696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004560	MF- 2020
24676	94:2337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018923	MF- 2060
24683	94:1874	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004911	MF- 2070
24694	94:697	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017475	MF- 2020
24698	94:698	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004926	MF- 2030
24702	94:217	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007284	MF-902
24739	94:2557	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017478	MF-904; MF-906
24741	94:1015	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004936	MF- 2030
24743	94:3043	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018450	MF- 2080
24752	94:1875	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018912	MF- 2000
24754	94:3044	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007287	MF- 2010

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24790	94:2558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019192	MF-2000
24843	94:218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007752	MF-2010; MF-2070
24849	94:1016	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018720	MF-2030
24899	94:1876	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007802	MF-2010
24936	94:1877	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009121	MF-2010
24951	94:1017	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008959	MF-2080
24970	94:2559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008960	MF-2020; MF-2050
24993	94:3045	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004935	MF-2000
25050	94:2338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004937	MF-2060
25159	94:2339	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007282	MF-2060
25177	94:2560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005400	MF-2070
25345	94:219	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004896	MF-2010
25362	94:699	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004903	MF-2010
25387	94:2340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008926	MF-2060
25469	94:220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004924	MF-2010
25549	94:2929	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007804	MF-2020
25615	94:221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005961	MF-2070
25649	94:1018	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008936	MF-2030
25672	94:1878	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008933	MF-2020
25864	94:222	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008937	MF-2000
POEF-3050	94:3002	See ES/ESH-50			
3051	94:3003	See ES/ESH-51			
PPPL-CFP-3088	94:4	See ANL/EA/SUMM-84626			
3178	94:4	See ANL/EA/SUMM-84626			
RFP-4810	94:2083	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011163	MF-902
4831	94:700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013523	MF-721
4900	94:223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006141	MF-2010
4903	94:701	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010358	MF-721
4927	94:702	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010273	MF-721
SAND-91-1526	94:224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004386	MF-2000
93-0681	94:225	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015597	MF-903
93-0808	94:2561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010660	MF-940
93-2441	94:2562	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001413	MF-2070
93-2450	94:2563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001113	MF-2070
93-7058	94:2564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009980	MF-940
93-7066	94:2565	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015530	MF-940

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94-0105C	94:2084	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007297	MF-902
94-0203C	94:2085	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018737	MF-2000
94-0482	94:2566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017291	MF-2000
94-0482C	94:2567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007933	MF-940
94-0495C	94:703	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018888	MF-2000
94-0513C	94:2341	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007854	MF-900
94-0595C	94:2342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008952	MF-940
94-0596C	94:2343	OSTI; NTIS; GPO Dep.	E 1.99:	DE94009285	MF-906
94-0599C	94:2568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005425	MF-2070
94-0676C	94:1879	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008617	MF-902
94-0715C	94:226	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007739	MF-902
94-0716C	94:227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008615	MF-902
94-0750C	94:228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008869	MF-902; MF-940
94-0764C	94:2569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008923	MF-940
94-0786C	94:704	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94009062	MF-902
94-0805C	94:229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001605	MF-2010
94-0844	94:2344	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009662	PC-2020
94-0981	94:230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001111	MF-2010
94-0996C	94:231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019181	MF-2000
94-1003C	94:705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011436	MF-940
94-1070C	94:2570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014283	MF-702
94-1119C	94:706	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011029	MF-900
94-1145C	94:2571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010756	MF-902
94-1235	94:2345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001793	MF-510
94-1237	94:2346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001794	MF-510
94-1444C	94:707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013342	MF-940
94-1657C	94:1880	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014248	MF-940
94-1667	94:2572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015040	MF-902
94-1718C	94:232	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004527	MF-2010
94-1916C	94:2573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011055	MF-2070
94-1958	94:233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018517	MF-2010
94-2061	94:3046	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011024	MF-2000
94-2072C	94:2347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018741	MF-2060
94-2128	94:2574	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008153	MF-2000
94-2134C	94:2575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004525	MF-2020
94-2136C	94:2576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004524	MF-2070
94-2248C	94:1881	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018908	MF-2010
94-2266C	94:2577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007729	MF-2070
94-2272C	94:3047	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000546	MF-2080
94-2275C	94:3048	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000535	MF-2010
94-2313C	94:2578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004776	MF-2000
94-2348C	94:2579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007730	MF-2000
94-2354C	94:2348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001617	MF-706
94-2380C	94:2930	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001618	MF-2030

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94-2387	94:234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008152	MF- 2000
94-2388	94:235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006502	MF- 2000
94-2409C	94:708	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006305	MF- 2020
94-2564C	94:709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006823	MF- 2020
94-2703C	94:2086	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002189	MF- 2050
94-2759	94:2087	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007711	MF- 2050
94-2759C	94:2088	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002187	MF- 2000
94-3012	94:236	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007759	MF- 2070
94-3123	94:237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007760	MF- 2070
94-8002	94:2089	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011627	MF-902
94-8005	94:710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018399	MF- 2020
94-8240	94:711	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015352	MF- 1414
94-8699C	94:2580	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004381	MF- 2020
95-0014C	94:1882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005428	MF- 2010
95-0070C	94:1883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006225	MF- 2040; MF- 2020
95-0117C	94:2581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006309	MF- 2000
95-0142C	94:238	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006825	MF-126
95-0143C	94:2090	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006819	MF- 2000
95-0172C	94:712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006458	MF- 2010
95-0195C	94:1884	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008548	MF- 2020
95-0289C	94:1885	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008532	MF- 2070
95-0290C	94:713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007728	MF- 2070
95-0344C	94:239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008547	MF- 2070
95-0436C	94:2582	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008529	MF- 2020
95-0437C	94:2091	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008530	MF- 2000
95-0495	94:2583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009540	MF- 2070
95-0564C	94:2584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009592	MF- 2000
95-0565C	94:2585	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95009591	MF- 2000
95-0568C	94:2586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009596	MF- 2000
95-0570C	94:3049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009584	MF- 2020
95-0574C	94:240	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009585	MF- 2020
95-0584C	94:714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009594	MF- 2010
95-0587C	94:2587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009593	MF- 2000

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95-0610C	94:2349	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009842	MF-2060
95-0759C	94:2092	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011015	MF-2000
95-0828C	94:3050	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010872	MF-2000
95-0834C	94:2093	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011016	MF-2000
95-2257C 95-8007	94:2585 94:715	See SAND-95-0565C OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006200	MF-2020
SD-WM-TI- 230-Rev.2	94:1019	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003762	MF-2030
SD-WM-TP- 30	94:2588	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016433	MF-902
SWE-SWB- 95-0004	94:2589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060100	MF-2020
UCRL-CR- 116576 118921	94:2434 94:241	See DOE/MWIP-27 OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005912	MF-2010
UCRL-ID- 110052 111766 115645	94:1020 94:1021 94:242	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; GPO Dep. OSTI; NTIS; GPO Dep.	E 1.99: E 1.99: E 1.99:	DE94014943 DE94014352 DE94017295	MF-902 MF-902 MF-2010
115754 116220	94:716 94:2350	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99:	DE94012587 DE95000512	MF-940 MF-2030
117120	94:1022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004196	MF-2030
118122	94:717	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE95006442	MF-2020
118926	94:1023	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006431	MF-2030
119706 120404	94:2590 94:2591	OSTI; NTIS; GPO Dep. OSTI; NTIS; GPO Dep.	E 1.99: E 1.99:	DE95009468 DE95009670	MF-902 MF-901; MF-902
UCRL-JC- 110055-Rev.1 113790-Rev.2 115345 115613 115670 115886	94:2592 94:2593 94:243 94:3051 94:1886 94:2594	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; GPO Dep. OSTI; NTIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99: E 1.99: E 1.99: E 1.99: E 1.99:	DE95004967 DE94011757 DE94016595 DE94016361 DE94016608 DE94017414	MF-902 MF-902 MF-903 MF-905 MF-902 MF-2010
116436 116572 116577 117153	94:244 94:245 94:3052 94:2351	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; GPO Dep. OSTI; NTIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99: E 1.99: E 1.99:	DE95002401 DE94016455 DE94014729 DE95008380	MF-820 MF-402 MF-902 MF-2060
117678 118317	94:246 94:1887	OSTI; NTIS; INIS; GPO Dep. OSTI; NTIS; INIS; GPO Dep.	E 1.99: E 1.99:	DE94017174 DE95008830	MF-721 MF-2070
118432	94:2595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002471	MF-2010
118797-Rev.1	94:2094	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009529	MF-2050
118890	94:2352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008457	MF-2020
119133	94:718	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008369	MF-2020
USGS-OFR- 89-582	94:66	See DOE/OR/21865-1			

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USGS-WRI-94-4053	94:55	See DOE/ID-22115			
WHC-EP-0125-6	94:719	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000429	MF-2010
0182-71	94:1024	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014581	MF-940
0182-74	94:1025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019038	MF-2030
0394-8	94:247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019056	MF-2010
0394-9	94:248	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006798	MF-2070
0407-Rev.2	94:1026	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016473	MF-900; MF-940
0431-Rev.1	94:1027	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019057	MF-2030
0446-2	94:2095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002361	MF-2070
0460	94:720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001296	MF-2030
0467-Rev.1	94:2096	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002474	MF-2000
0468-3	94:2097	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001031	MF-2070
0473-Rev.1	94:1028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016476	MF-900; MF-940
0473-Rev.2	94:1029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010200	MF-2030
0474-10	94:1030	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014635	MF-940
0474-13	94:1031	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016463	MF-940
0474-14	94:1032	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003267	MF-2030
0474-15	94:1033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008033	MF-2070
0527-3	94:721	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001314	MF-2010
0532-Rev.2	94:1034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005054	MF-2030
0544-Rev.1	94:2596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010201	MF-2070
0549-Vol.1-2	94:17	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010946	MF-2000
0549-Vol.3-4	94:2098	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010947	MF-2000
0549-Vol.5	94:18	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010948	MF-2000
0562-Rev.1	94:1035	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014579	MF-940
0573-2	94:2099	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019342	MF-2010
0579	94:1036	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011452	MF-940
0694	94:249	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001554	MF-2010
0707	94:2597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013007	MF-902
0711	94:1037	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016479	MF-900
0718	94:2598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013971	MF-940
0722	94:2599	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011339	MF-900
0722-Add.2	94:2600	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011337	MF-900
0722-Add.3-Draft	94:2601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015662	MF-902
0729	94:1038	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016478	MF-902; MF-940
0730	94:250	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000733	MF-2010
0733-Rev.1	94:1039	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017983	MF-2030
0739	94:1040	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004102	MF-2070
0741	94:2602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010068	MF-2070

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0743	94:1041	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016459	MF-902
0750-Vol.1-Rev.1	94:1042	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007478	MF-2030
0750-Vol.2-Rev.1	94:1043	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007479	MF-2030
0750-Vol.3-Rev.1	94:1044	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007480	MF-2030
0750-Vol.4-Rev.1	94:1045	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007481	MF-2030
0750-Vol.5-Rev.1-2	94:1046	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007482	MF-2030
0750-Vol.6-Rev.1	94:1047	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007483	MF-2030
0750-Vol.7-Rev.1	94:1048	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007484	MF-2030
0756	94:1049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013968	MF-940
0758	94:1050	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000735	MF-2000
0766	94:2931	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014639	MF-902
0768	94:2603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014268	MF-940
0769	94:2604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015661	MF-940
0769-Rev.1	94:251	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017997	MF-2000
0772	94:1051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016475	MF-902
0775	94:1052	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001527	MF-2030
0777	94:252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014115	MF-902
0779-Draft	94:2605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018003	MF-2000
0780	94:1053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016458	MF-940
0782-Vol.1	94:1054	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001846	MF-2030
0782-Vol.2	94:1055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001847	MF-2030
0783-Draft	94:2606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018004	MF-2020
0784	94:1056	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016470	MF-902
0785	94:1057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019058	MF-2070
0786	94:1058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002232	MF-2030
0787	94:2607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019043	MF-2070
0790	94:2608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010067	MF-2050
0791	94:1059	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019039	MF-2030
0793	94:1060	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000796	MF-2030
0794	94:1061	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001529	MF-2030
0795	94:2609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005476	MF-2070
0796	94:1062	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000459	MF-2030
0797	94:253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002469	MF-2070
0800	94:1063	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000734	MF-2030
0801-Draft	94:2610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001579	MF-2050
0802	94:722	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002473	MF-2020
0803	94:723	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000436	MF-2020
0804	94:724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001988	MF-2020

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0805	94:1064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001843	MF- 2030
0806	94:1065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003215	MF- 2030
0807	94:1066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005470	MF- 2030
0809	94:1067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002106	MF- 2030
0813	94:254	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005055	MF- 2010
0816	94:1068	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001578	MF- 2010
0822	94:2611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003994	MF- 2000
0823	94:2612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002971	MF- 2000
0829	94:2100	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005056	MF- 2020
0830-Vol.1	94:2613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003216	MF- 2050
0830-Vol.2	94:2614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003217	MF- 2050
0830-Vol.3	94:2615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006835	MF- 2070
0831	94:1069	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005600	MF- 2030
0832	94:2932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005982	MF- 2030
0834	94:1888	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004975	MF- 2030
0835	94:255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007184	MF- 2000
0839	94:1070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005477	MF- 2070
0845	94:725	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010114	MF- 2000
0847	94:1071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007772	MF- 2030
0848	94:2616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008792	MF- 2000; MF- 2030
0850	94:2101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008034	MF- 2070
0852	94:2617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010066	MF- 2070
WHC-MR- 0418	94:2102	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001986	MF- 2070
0452	94:2103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013882	MF-902
0452-Add.1	94:2104	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013881	MF-900
0455	94:1072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011399	MF-902
0463	94:2105	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015332	MF-900
0465	94:2106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000732	MF- 2000
0483	94:1073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004980	MF- 2030
0489	94:2618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007818	MF- 2000
0492	94:1074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008460	MF- 2030
WHC-SA- 1196-Rev.1	94:1075	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007560	MF- 2030
1455	94:2619	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017416	MF- 2000

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1601	94:1076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004104	MF-2030
1787	94:726	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013230	MF-940; MF-902
1884	94:1077	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001641	MF-2030
1937	94:256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001642	MF-2070
1950	94:257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000458	MF-2020
1968	94:1889	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016469	MF-902
1987	94:727	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012401	MF-940
2016	94:1078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015755	MF-940
2077	94:2107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013573	MF-940
2141	94:2108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001987	MF-2000
2162	94:728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013250	MF-902
2209	94:3053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003272	MF-2000
2210	94:3054	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003273	MF-2000
2221	94:729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016467	MF-940
2235	94:730	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018150	MF-2020
2241	94:731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015637	MF-902
2268	94:258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013231	MF-902
2282	94:3055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014127	MF-902
2292	94:732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016474	MF-902; MF-906
2302	94:2353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001643	MF-2020
2305	94:1079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000525	MF-2030
2317	94:2620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015707	MF-940
2335	94:1080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014629	MF-940
2337	94:2621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018489	MF-2030
2347	94:1081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013008	MF-940
2355	94:733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013880	MF-906
2358	94:259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015669	MF-902; MF-940
2377	94:260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015753	MF-902; MF-903
2393	94:2622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014118	MF-902
2403	94:2109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000797	MF-2050
2406	94:734	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013227	MF-902
2407	94:1082	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004488	MF-2030
2413	94:2110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014637	MF-940
2425	94:2623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013583	MF-940
2433	94:2624	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014636	MF-940
2434	94:3056	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018164	MF-2000
2435	94:735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013972	MF-940
2447	94:1083	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003044	MF-2030
2448	94:2354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003045	MF-2030
2449	94:1084	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003046	MF-2030
2452	94:2625	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014638	MF-901; MF-940
2453	94:2626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014121	MF-902
2460	94:2627	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013585	MF-940
2478	94:1085	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015710	MF-902
2480	94:2933	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018002	MF-2030

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2481	94:261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013228	MF-940
2491	94:2111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007791	MF- 2050
2504	94:1086	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002476	MF- 2030
2505	94:2628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004362	MF- 2000
2516	94:2112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015708	MF-906; MF-902; MF-940
2518	94:736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016477	MF-906
2539	94:1087	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002966	MF- 2030
2540	94:1088	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005139	MF- 2030
2543	94:737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:		MF- 2020
2544	94:1089	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005161	MF- 2030
2549	94:1090	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005160	MF- 2000
2551	94:2629	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000460	MF- 2030
2559	94:2113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017995	MF- 2070
2562	94:1091	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018157	MF- 2000
2563	94:1092	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000997	MF- 2030
2565	94:1093	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004163	MF- 2030
2568	94:2114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018153	MF- 2000
2569	94:2630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018154	MF- 2000
2583	94:2115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018689	MF- 2000
2584	94:1094	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000517	MF- 2070
2587	94:2116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018155	MF- 2000
2594	94:3057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018160	MF- 2000
2595	94:1095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007186	MF- 2030
2609	94:2631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006885	MF- 2070
2613	94:1096	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007776	MF- 2030
2617	94:1097	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007778	MF- 2020
2618	94:1098	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002467	MF- 2000
2621	94:2117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006799	MF- 2050
2624	94:738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018684	MF- 2020
2625	94:2632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007775	MF- 2020
2627	94:2355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002475	MF- 2060
2628	94:2633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007777	MF- 2000
2633	94:2118	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006629	MF- 2000
2639	94:1099	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007780	MF- 2030

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2640	94:262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000336	MF- 2010
2651	94:1100	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007774	MF- 2020
2657	94:3058	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001313	MF- 2000
2664	94:2356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001640	MF- 2060
2666	94:739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004511	MF- 2010
2669	94:1101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002478	MF- 2030
2675	94:740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010108	MF- 2000
2676	94:741	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010107	MF- 2000
2683	94:3059	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001534	MF- 2080
2690	94:1102	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003945	MF- 2030
2696	94:1103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006768	MF- 2030
2705	94:2357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006836	MF- 2060
2707	94:2119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005478	MF- 2050
2709	94:2120	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003853	MF- 2020
2723	94:3060	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006767	MF- 2000
2729	94:2121	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007795	MF- 2050
2745	94:3061	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004973	MF- 2000
2753	94:3062	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004974	MF- 2000
2755	94:263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005984	MF- 2050
2756	94:742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005983	MF- 2020
2772	94:2634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008031	MF- 2020
2782	94:2122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008032	MF- 2050
2784	94:2123	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010851	MF- 2070
2804	94:1104	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008030	MF- 2030
2810	94:264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009091	MF- 2010
WHC-SD-534-CSWD- 006-Rev.1	94:265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010093	MF- 2030
WHC-SD-534-CSWL- 001-Rev.2	94:266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008814	MF- 2030
WHC-SD-610-ATP- 002	94:1105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000995	MF- 2000
WHC-SD-C018-RPT- 003	94:267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001036	MF- 2020
WHC-SD-C018H-HC- 002-Rev.1	94:2124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011547	MF- 2000

WHC-SD-C018H-TP-

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WHC-SD-C018H-TP- 010-Rev.1	94:2125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000456	MF- 2000
WHC-SD-C018H-TRP- 015	94:743	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010564	MF- 2030
WHC-SD-C217-ES- 001	94:2126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006658	MF- 2050
WHC-SD-CP-ANAL- 008	94:2127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006893	MF- 2000
010	94:2128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006711	MF- 2050
WHC-SD-CP-DA- 093	94:2129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003765	MF- 2000
WHC-SD-CP-ES- 160	94:2130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019011	MF- 2000
165	94:2635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006882	MF- 2070
166	94:2131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007227	MF- 2020
WHC-SD-CP-HC- 004	94:2132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005069	MF- 2050
005	94:2636	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010598	MF- 2050
WHC-SD-CP-HSP- 002	94:2133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005082	MF- 2050
WHC-SD-CP-MAR- 001	94:2134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000991	MF- 2050
WHC-SD-CP-OMM- 003	94:2135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004485	MF- 2000
WHC-SD-CP-OTP- 152-Rev.1	94:2136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006657	MF- 2050
WHC-SD-CP-OTR- 151	94:1106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004160	MF- 2050
WHC-SD-CP-PLN- 025	94:744	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001306	MF- 2070
026	94:745	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002081	MF- 2020
027-Rev.1	94:2137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008465	MF- 2070
028	94:2637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006849	MF- 2050; MF- 2070
WHC-SD-CP-QAPP- 015	94:746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002082	MF- 2020
016	94:2638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010198	MF- 2020
WHC-SD-CP-RD- 022-Rev.1	94:2138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004431	MF- 2050
WHC-SD-CP-RPT- 012-Rev.1	94:2139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004487	MF- 2050

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WHC-SD-CP-SA- 023-Rev.1	94:2140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003245	MF- 2000
027	94:2141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005280	MF- 2000
028	94:2142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010143	MF- 2000
WHC-SD-CP-SAR- 021-Vol.1	94:2143	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009101	MF- 2000
021-Vol.2	94:2144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009102	MF- 2000
WHC-SD-CP-TC- 031	94:2145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004162	MF- 2050
032-Rev.1	94:2146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007224	MF- 2020
WHC-SD-CP-TEEM- 069	94:2147	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003839	MF- 2050
WHC-SD-CP-TI- 108-Rev.14	94:2148	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006780	MF- 2050
193-Rev.1	94:2149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010054	MF- 2000
194	94:2150	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005075	MF- 2050
WHC-SD-CP-TP- 076	94:2639	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000501	MF- 2000
076-Rev.1	94:2640	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011660	MF- 2000
077	94:2641	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000514	MF- 2000
077-Rev.1	94:2642	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005435	MF- 2050
079	94:2643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003767	MF- 2050
080	94:2644	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003770	MF- 2050
082	94:2151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005220	MF- 2050
083	94:2152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010091	MF- 2030
084	94:2153	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010190	MF- 2050
WHC-SD-CP-TR- 006	94:3063	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005133	MF- 2050
WHC-SD-CP-TRP- 060	94:2154	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006781	MF- 2050
WHC-SD-EN-AP- 093	94:2645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010672	MF- 2070
117	94:747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012937	MF-902
151-Rev.1	94:268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012932	MF-902
159	94:1890	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014113	MF-903
165	94:269	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007786	MF- 2070
166	94:2155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015706	MF-940
168	94:748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013013	MF-902
171	94:2156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010675	MF- 2070
172	94:2157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010674	MF- 2070
177	94:2158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000798	MF- 2000

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179	94:270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000433	MF-2030
181	94:271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003857	MF-2070
184	94:272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010089	MF-2010
WHC-SD-EN-DP- 071-Rev.1	94:273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008451	MF-2010
082	94:274	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012933	MF-903
089	94:275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015337	MF-902
090	94:276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005628	MF-2070
WHC-SD-EN-EE- 014	94:277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010074	MF-2000
WHC-SD-EN-ES- 040	94:1107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014123	MF-940
WHC-SD-EN-EV- 030	94:749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004497	MF-2020
WHC-SD-EN-PMP- 008	94:278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015331	MF-900
WHC-SD-EN-PRS- 002	94:279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005629	MF-2050
WHC-SD-EN-QAPP- 003-Rev.2	94:750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010147	MF-2020
WHC-SD-EN-RA- 005	94:2646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016234	MF-902
007	94:280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005405	MF-2010
009	94:751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019341	MF-2010
010	94:281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015671	MF-903
WHC-SD-EN-RD- 010	94:1108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000447	MF-2030
WHC-SD-EN-RPT- 009	94:752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014120	MF-902
010	94:2647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014125	MF-903
011	94:2648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014128	MF-906
025	94:2159	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017323	MF-2020
WHC-SD-EN-TI- 203	94:753	OSTI; NTIS; GPO Dep.	E 1.99:	DE94009614	MF-900
204	94:282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000988	MF-2000
210	94:2160	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015728	MF-940
211	94:283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010368	MF-903
213	94:2161	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015724	MF-902
217	94:2162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015740	MF-940
220	94:754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018110	MF-2020
223	94:1109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005640	MF-2070
229	94:284	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004370	MF-2000
230	94:285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015741	MF-903
234	94:755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014117	MF-902
240	94:756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013006	MF-902
241	94:2649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004508	MF-2070
242	94:757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015754	MF-903;
245	94:758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015672	MF-940

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247	94:2163	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001573	MF-2000
248	94:286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015756	MF-903
253	94:287	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005099	MF-2010
263	94:288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005465	MF-2070
265	94:759	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015335	MF-903
266	94:289	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015329	MF-903
267	94:290	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015645	MF-903
268	94:2650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014270	MF-903
271	94:291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003862	MF-2010
277	94:760	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017325	MF-2010
279	94:2651	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015649	MF-940
280	94:292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018470	MF-2010
281	94:293	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000430	MF-2000
282	94:761	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005631	MF-2070
285	94:2652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019010	MF-2040
288	94:2164	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017998	MF-2000
290	94:762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002156	MF-2070
292	94:763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004512	MF-2000
296	94:2165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008475	MF-2070
WHC-SD-EN-TP-032	94:294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010673	MF-2070
043	94:295	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014408	MF-906; MF-902
044	94:296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014119	MF-902
047-Rev.1	94:297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004148	MF-2020
048	94:764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019040	MF-2000
049	94:765	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015752	MF-940
050	94:2166	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005134	MF-2070
051	94:298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010036	MF-2010
WHC-SD-EN-TRP-007	94:299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001463	MF-2040
WHC-SD-EN-WP-012	94:300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010111	MF-2070
WHC-SD-ER-CSWD-004	94:301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000437	MF-2000
WHC-SD-ER-TC-001	94:766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001562	MF-2010
WHC-SD-ER3297-TS-001-Rev.1	94:1110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005439	MF-2030
001-Rev.2	94:1111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008433	MF-2030
WHC-SD-ER3641-ATP-002-Rev.2	94:1112	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000345	MF-2030

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003-Rev.1	94:2653	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000342	MF- 2030
WHC-SD-ER3641-OTP-					
001-Rev.1	94:1113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009104	MF- 2030
004-Rev.1	94:1114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009160	MF- 2030
WHC-SD-ETF-PCP-					
001	94:302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010061	MF- 2000
WHC-SD-ETF-PLN-					
002	94:303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001539	MF- 2020
WHC-SD-ETF-TA-					
001	94:304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005641	MF- 2020
WHC-SD-ETF-WAC-					
001	94:767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003995	MF- 2020
WHC-SD-F031-PMP-					
002	94:2167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005294	MF- 2050
WHC-SD-F031-QAPP-					
001	94:2168	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005291	MF- 2050
WHC-SD-FF-CDR-					
006	94:2169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008047	MF- 2050
WHC-SD-FF-CSWL-					
00016-Rev.1	94:2654	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002479	MF- 2000
WHC-SD-FF-DRR-					
00018	94:2170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005286	MF- 2000
WHC-SD-FF-ER-					
099	94:2171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001536	MF- 2030
101	94:2172	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008499	MF- 2030
102	94:2173	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007782	MF- 2030
WHC-SD-FF-EV-					
002	94:1115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005141	MF- 2020
WHC-SD-FF-OMM-					
010	94:2174	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003064	MF- 2000
WHC-SD-FF-PSE-					
002	94:2175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001541	MF- 2050
WHC-SD-FF-SSP-					
004-Rev.1	94:2176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003860	MF- 2050
050-Rev.1	94:2177	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002961	MF- 2030
052	94:2178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001565	MF- 2050
WHC-SD-FF-TA-					
034	94:2179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006848	MF- 2050
WHC-SD-GN-CSWD-					
30036-Rev.1	94:2180	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002141	MF- 2000
WHC-SD-GN-DGS-					
30011	94:2181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001566	MF- 2020

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WHC-SD-GN-ER-30034	94:2182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005162	MF-2000
WHC-SD-GN-ICD-20001	94:2183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007181	MF-2050
WHC-SD-GN-ISB-30001	94:3064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001568	MF-2000
WHC-SD-GN-QAPP-001-Rev.1	94:2184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008466	MF-2000
WHC-SD-GN-SA-30006	94:2655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002120	MF-2000
WHC-SD-GN-SDD-30007-Rev.1	94:2185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003218	MF-2000
WHC-SD-GN-TA-30004	94:2656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003040	MF-2070
WHC-SD-GN-TRP-20014	94:2186	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003865	MF-2000
20024	94:2187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003073	MF-2060
20025	94:2188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003859	MF-2000; MF-2060
20026	94:2189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004492	MF-2000
30010	94:2190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000434	MF-2060
30011	94:2191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001041	MF-2000
30018	94:2192	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001538	MF-2060
WHC-SD-HWV-PLN-002-Rev.5	94:768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004161	MF-2020
WHC-SD-HWV-UM-004-Rev.1	94:2657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000989	MF-2000
WHC-SD-HWV-WP-005	94:2658	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95002072	MF-2070
WHC-SD-L045H-CSCM-001	94:769	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003778	MF-2020
WHC-SD-L045H-CSDD-001	94:770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003065	MF-2030
WHC-SD-L045H-CSWD-002	94:771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004154	MF-2000
WHC-SD-L045H-ER-003	94:772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000985	MF-2000
WHC-SD-L045H-OTR-001	94:773	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002364	MF-2030
WHC-SD-L045H-PC-001	94:774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001559	MF-2000
WHC-SD-L045H-PLN-004	94:775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002070	MF-2000

WHC-SD-L045H-RPT-

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WHC-SD-L045H-RPT-001	94:776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003779	MF-2020
WHC-SD-L045H-RRR-001-Rev.1	94:777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003775	MF-2020
WHC-SD-L045H-SM-001	94:778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003243	MF-2000
001-Rev.1	94:779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010090	MF-2070
WHC-SD-L045H-TI-005	94:780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003239	MF-2020
WHC-SD-L070-PMP-001	94:781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001040	MF-2010
WHC-SD-L097-ATP-005	94:2193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005608	MF-2000
WHC-SD-L116-CDR-001	94:782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003329	MF-2000
WHC-SD-L205-ATP-001	94:2194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005607	MF-2000
WHC-SD-L225-ATP-001	94:2195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004786	MF-2000
WHC-SD-LEF-CSCM-001	94:783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008500	MF-2070
WHC-SD-LEF-OTR-001	94:784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008801	MF-2020
WHC-SD-LEF-PLN-001	94:785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009143	MF-2070
002	94:786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010039	MF-2070
WHC-SD-LEF-QAPP-001	94:787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009157	MF-2010
002	94:788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010149	MF-2010
WHC-SD-LEF-TS-001	94:789	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005462	MF-2020
001-Rev.1	94:790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007226	MF-2000
001-Rev.2	94:791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007794	MF-2020
WHC-SD-LL-ATR-020	94:2196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006832	MF-2000
WHC-SD-LL-ES-040	94:2197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000431	MF-2000
WHC-SD-NR-ANAL-014	94:2659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017999	MF-2000
WHC-SD-NR-CSER-011-Rev.1	94:2660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003221	MF-2000
013	94:2661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001840	MF-2030
014-Rev.1	94:2662	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004753	MF-2000

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015	94:2663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003240	MF-2000
WHC-SD-NR-ER-105	94:2664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002110	MF-2020
WHC-SD-PRP-HA-001-Rev.2	94:2198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006850	MF-2010
005	94:2665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000428	MF-2000
007	94:2199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001582	MF-2030
008	94:2200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001042	MF-2000
010	94:2201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001596	MF-2000
011	94:2202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001003	MF-2050
012	94:2203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001043	MF-2000
013	94:2204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001581	MF-2030
014	94:2205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004756	MF-2070
015	94:2206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004107	MF-2000
016	94:2207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001594	MF-2000
017	94:2208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005649	MF-2050
WHC-SD-RE-SEL-001-Rev.2	94:2209	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004484	MF-2050
WHC-SD-RTG-WP-001	94:2210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004152	MF-2000
WHC-SD-SNF-AP-001	94:2666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005630	MF-2070
WHC-SD-SNF-ATP-004	94:305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005678	MF-2020
005	94:306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003077	MF-2020
006	94:2211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006791	MF-2070
WHC-SD-SNF-ATR-003	94:2212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002152	MF-2000
WHC-SD-SNF-CM-002	94:2213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007189	MF-2050
WHC-SD-SNF-CMD-001	94:2214	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009151	MF-2050
WHC-SD-SNF-CR-001	94:2215	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005217	MF-2070
002	94:2216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005136	MF-2070
WHC-SD-SNF-CSER-001	94:2217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001307	MF-2000
002	94:2218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004495	MF-2030
WHC-SD-SNF-DA-004	94:2667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007176	MF-2020

WHC-SD-SNF-DA-

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009	94:2219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010593	MF- 2000
WHC-SD-SNF-DQO-					
001	94:2668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007785	MF- 2070
002	94:2669	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008473	MF- 2070
003	94:2670	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008429	MF- 2070
WHC-SD-SNF-DR-					
001	94:2671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008805	MF- 2070
WHC-SD-SNF-DRP-					
001	94:2672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008035	MF- 2050
WHC-SD-SNF-DRR-					
002-Vol.1	94:2220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010134	MF- 2000
002-Vol.2	94:2221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010133	MF- 2000
WHC-SD-SNF-EDL-					
001	94:2222	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005643	MF- 2050
WHC-SD-SNF-ER-					
002	94:2673	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003861	MF- 2010
003	94:2674	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001557	MF- 2070
004	94:2223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002962	MF- 2000
005	94:307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005432	MF- 2000
006	94:308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005223	MF- 2010
WHC-SD-SNF-ES-					
001	94:309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001035	MF- 2010
002	94:310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001033	MF- 2000
005	94:792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003061	MF- 2020
006	94:2675	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007173	MF- 2070
007	94:2676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011548	MF- 2070
008	94:2677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010740	MF- 2000
WHC-SD-SNF-FDC-					
001	94:2678	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003253	MF- 2020
001-Rev.1	94:2679	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005644	MF- 2070
WHC-SD-SNF-FDR-					
001	94:2680	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003224	MF- 2010
WHC-SD-SNF-FRD-					
003	94:2681	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005226	MF- 2050
005	94:2682	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003049	MF- 2020
007	94:2683	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005632	MF- 2070
WHC-SD-SNF-FVP-					
001	94:2224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004366	MF- 2050
002	94:2225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010040	MF- 2050

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WHC-SD-SNF-HC- 001	94:2684	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005642	MF- 2000
002	94:793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005295	MF-610
002-Rev.1	94:2685	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008472	MF- 2070
WHC-SD-SNF-LB- 001	94:2226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001649	MF- 2000
WHC-SD-SNF-PCP- 001	94:2686	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003050	MF- 2000
001-Rev.1	94:2227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005140	MF- 2000
WHC-SD-SNF-PD- 001	94:2687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002366	MF- 2020
007	94:2688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003225	MF- 2020
009	94:2689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008875	MF- 2000
WHC-SD-SNF-PHA- 001	94:2690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018506	MF- 2000
WHC-SD-SNF-PLN- 001	94:2691	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002108	MF- 2070
004	94:2692	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008428	MF- 2070
WHC-SD-SNF-PMP- 002	94:2693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003777	MF- 2020
008	94:2694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005083	MF- 2070
WHC-SD-SNF-PTR- 001	94:2695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004788	MF- 2020
WHC-SD-SNF-RA- 001	94:2696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005100	MF- 2050
WHC-SD-SNF-SARR- 001	94:2697	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001598	MF- 2000
002-Rev.2	94:2698	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005633	MF- 2000
002-Rev.3	94:2699	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005292	MF- 2050
003	94:2700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005622	MF- 2000
004	94:2701	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004494	MF- 2070
WHC-SD-SNF-SD- 002	94:2702	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010097	MF- 2050
003-Vol.1	94:2703	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009148	MF- 2000
WHC-SD-SNF-SM- 001	94:2704	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007178	MF- 2070
002	94:2705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008806	MF- 2070
WHC-SD-SNF-TA- 002	94:2706	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005645	MF- 2050
003	94:2707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005646	MF- 2050
004	94:2708	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006794	MF- 2070

WHC-SD-SNF-TA-

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005	94:2709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006793	MF- 2050
WHC-SD-SNF-TC-					
001	94:2228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001597	MF- 2020
002	94:2710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008891	MF- 2000
WHC-SD-SNF-TI-					
002	94:2711	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005463	MF- 2050
004	94:2712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000994	MF- 2070
006	94:311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006651	MF- 2070
010	94:2713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007783	MF- 2070
012	94:2714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008833	MF- 2070
WHC-SD-SNF-TP-					
003	94:2715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002148	MF- 2000
004	94:2716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002147	MF- 2000
007	94:2717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001531	MF- 2050
008	94:2718	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001558	MF- 2070
008-Rev.1	94:2719	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006653	MF- 2070
009	94:2720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003082	MF- 2020
009-Rev.1	94:2721	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010056	MF- 2010
010	94:2722	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007182	MF- 2070
011	94:2723	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008471	MF- 2070
012	94:2724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008474	MF- 2070
013	94:2725	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010145	MF- 2070
WHC-SD-SNF-TRP-					
001	94:2726	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004151	MF- 2000
002	94:2727	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007228	MF- 2070
003	94:2728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008802	MF- 2070
004	94:2729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009094	MF- 2030
WHC-SD-SNF-WP-					
001	94:2730	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003054	MF- 2000
007	94:2731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000435	MF- 2050
010	94:2732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003776	MF- 2020
011	94:2733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003855	MF- 2070
012	94:2734	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007225	MF- 2070
WHC-SD-SP-PHA-					
001	94:2229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005164	MF- 2050
WHC-SD-SP-SSP-					
001	94:2230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019054	MF- 2000

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WHC-SD-SQA-CSA- 20368	94:1116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001032	MF- 2030
20373	94:1117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001304	MF- 2030
20374	94:2735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001644	MF- 2000
20376	94:2736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005167	MF- 2050
20377	94:2737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001637	MF- 2030
20380	94:2738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003169	MF- 2020
20381	94:2739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004750	MF- 2000
20382	94:2740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004147	MF- 2020
20383	94:2741	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005166	MF- 2050
20384	94:2742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004491	MF- 2070
20387	94:2743	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006827	MF- 2050
WHC-SD-SQA-CSWD- 30016	94:794	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001599	MF- 2010
WHC-SD-SQA-TA- 20010-Rev.1	94:2744	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007223	MF- 2070
20011-Rev.1	94:1118	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000679	MF- 2070
20011-Rev.2	94:1119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010104	MF- 2030
20015-Rev.1	94:2745	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006792	MF- 2050
WHC-SD-T100-CDR- 001	94:3065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003852	MF- 2000
WHC-SD-T100-FDC- 001-Rev.1	94:3066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009096	MF- 2000
WHC-SD-T100-PLN- 001	94:3067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003850	MF- 2000
WHC-SD-T100-PMP- 001	94:3068	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005288	MF- 2000
WHC-SD-T100-QAPP- 001	94:3069	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003772	MF- 2000
WHC-SD-TD-CR- 001	94:2358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005464	MF- 2060
WHC-SD-TD-ER- 004	94:2359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001564	MF- 2030
WHC-SD-TD-ICD- 001	94:2360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005068	MF- 2030
WHC-SD-TD-RPT- 010	94:1120	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002365	MF- 2020
011	94:1121	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002363	MF- 2070
012	94:1122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002282	MF- 2070

WHC-SD-TD-WP-

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WHC-SD-TD-WP- 0050	94:1123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005285	MF- 2030; MF- 2020
WHC-SD-TP-ANAL- 002	94:2746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010144	MF- 2000
WHC-SD-TP-PDC- 001-Rev.1	94:2747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000439	MF- 2020
022	94:2748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000506	MF- 2070
026	94:2749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005165	MF- 2020
WHC-SD-TP-RPT- 014	94:795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001546	MF- 2020
015	94:2231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003866	MF- 2000
017	94:2232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006707	MF- 2000
018	94:2233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006706	MF- 2000
WHC-SD-TP-SEP- 024	94:1124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018680	MF- 2030
026	94:1125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002079	MF- 2020
028	94:2750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002119	MF- 2030
029	94:2234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010075	MF- 2000
030	94:2751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010062	MF- 2030
WHC-SD-TP-UM- 002-Rev.1	94:2235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002278	MF- 2000
WHC-SD-TPWP- 001	94:2752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008027	MF- 2000
WHC-SD-W-113-OCD- 001	94:2766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001533	MF- 2030
WHC-SD-W007H-ATP- 001	94:796	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002085	MF- 2000
002	94:797	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002086	MF- 2000
WHC-SD-W007H-ATR- 001	94:798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005650	MF- 2050
002	94:799	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005603	MF- 2050
WHC-SD-W007H-FDC- 001-Rev.3	94:800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006595	MF- 2020
WHC-SD-W007H-OTP- 001	94:801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008420	MF- 2050
WHC-SD-W025-ATP- 002	94:802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005680	MF- 2000
WHC-SD-W025-ATR- 001-Rev.1	94:2753	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004111	MF-700
002	94:803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005234	MF- 2000

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WHC-SD-W025-EMS-002	94:804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003846	MF-2000
002-Rev.1	94:805	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004471	MF-2020
WHC-SD-W025-FDR-001-Rev.1-Vol.1-2	94:806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004403	MF-2020
WHC-SD-W025-PLN-002	94:807	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003306	MF-2020
WHC-SD-W025-RPT-001	94:808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005935	MF-2000
002	94:809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010703	MF-2020
003	94:810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005137	MF-2040
WHC-SD-W025-VI-001	94:811	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002083	MF-2020
001-Rev.1	94:812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004158	MF-2020
WHC-SD-W026-OCD-001	94:2754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001593	MF-2020
WHC-SD-W026-PLN-004	94:813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003844	MF-2000
005	94:814	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006886	MF-2070
006	94:815	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010148	MF-2020
WHC-SD-W026-QAPP-001-Rev.1	94:816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010105	MF-2000
WHC-SD-W026-SDD-001	94:2755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009114	MF-2020
WHC-SD-W026-SDP-001	94:2756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004108	MF-2000
WHC-SD-W026-TC-002	94:817	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004981	MF-2070
WHC-SD-W026-TI-006-Rev.1	94:2757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001838	MF-2020
009	94:2758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002071	MF-2020
WHC-SD-W026-TP-001	94:818	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001981	MF-2000
008	94:819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001842	MF-2020
WHC-SD-W049-ATR-001	94:312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005440	MF-2010
WHC-SD-W049H-ATP-001	94:313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001516	MF-2010
002	94:314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003764	MF-2010
003	94:315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003763	MF-2010
WHC-SD-W049H-ATR-002	94:316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005683	MF-2010

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003	94:317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005080	MF- 2010
WHC-SD-W049H-CSRS- 001	94:318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004470	MF- 2020
WHC-SD-W049H-ICD- 001-Rev.1	94:319	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004472	MF- 2020
WHC-SD-W049H-RRR- 001	94:320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007193	MF- 2000
WHC-SD-W058-FDC- 001-Rev.2	94:1126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018502	MF- 2030
WHC-SD-W058-WP- 001	94:1127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005672	MF- 2000
WHC-SD-W059-FDC- 002	94:2759	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008419	MF- 2050
WHC-SD-W059-FHA- 001	94:2760	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010577	MF- 2050
WHC-SD-W059-FRD- 001-Rev.1	94:2761	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000338	MF- 2070
WHC-SD-W059-PSE- 002	94:2236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008879	MF- 2050
WHC-SD-W087-FDC- 001-Rev.3	94:2762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003051	MF- 2000
WHC-SD-W087-PMP- 001-Rev.1	94:2763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005620	MF- 2070
WHC-SD-W100-AP- 002	94:820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002113	MF- 2020
WHC-SD-W100-DTR- 003	94:821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004418	MF- 2020
WHC-SD-W100-ES- 009	94:822	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004103	MF- 2020
WHC-SD-W100-RD- 001-Rev.1	94:823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003782	MF- 2020
WHC-SD-W100-SDRD- 001	94:824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001839	MF- 2020
WHC-SD-W100-TC- 001	94:825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003066	MF- 2020
WHC-SD-W100-TD- 001	94:826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010088	MF- 2020
WHC-SD-W100-TI- 009	94:2764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005647	MF- 2020
WHC-SD-W100-TP- 011	94:827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001520	MF- 2020
014	94:828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002109	MF- 2020
WHC-SD-W105-OTR- 003	94:321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003851	MF- 2000

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WHC-SD-W112-CSER-001	94:829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010103	MF-2020
WHC-SD-W112-ES-006	94:830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001600	MF-2050
WHC-SD-W112-SDRD-001	94:831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005050	MF-2020
WHC-SD-W113-ACDR-001	94:2765	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018109	MF-2030
WHC-SD-W113-SDRD-001	94:832	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005066	MF-2020
WHC-SD-W151-ANAL-001	94:1128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004749	MF-2030
WHC-SD-W151-ATP-001-Rev.1	94:1129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006596	MF-2030
002	94:1130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010226	MF-2030
WHC-SD-W151-ETP-001	94:1131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010045	MF-2030
WHC-SD-W151-QAPP-001-Rev.2	94:1132	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004361	MF-2020
WHC-SD-W151-TI-002	94:1133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004363	MF-2030
WHC-SD-W151-WP-005	94:1134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006782	MF-2030
WHC-SD-W178-PMP-001	94:1135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006883	MF-2030
WHC-SD-W178-QAPP-001	94:1136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008855	MF-2010
WHC-SD-W211-TDR-001	94:1137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010150	MF-2020
WHC-SD-W211-TI-002	94:1138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009093	MF-2030
WHC-SD-W221-DP-001	94:2767	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002360	MF-2000
WHC-SD-W221-ES-002	94:2768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001540	MF-2050
WHC-SD-W236A-ER-008	94:1139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002144	MF-2030
010	94:1140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003871	MF-2030
011	94:1141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001436	MF-2030
014	94:1142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004430	MF-2030
015	94:1143	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005985	MF-2030
WHC-SD-W236A-ES-003	94:1144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003234	MF-2030

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005	94:1145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003167	MF- 2030
011	94:1146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011640	MF- 2030
WHC-SD-W236A-MP- 001-Rev.1	94:1147	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007219	MF- 2030
WHC-SD-W236A-PLN- 002	94:1148	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005104	MF- 2030
006-Rev.2	94:1149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009092	MF- 2000
WHC-SD-W236A-RPT- 004	94:1150	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004110	MF- 2000
WHC-SD-W236A-SDRD- 001-Rev.1	94:1151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005466	MF- 2030
WHC-SD-W236A-TI- 004	94:1152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005105	MF- 2030
005	94:1153	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006599	MF- 2050
006	94:1154	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006656	MF- 2030
007	94:1155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006630	MF- 2030
008	94:1156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006631	MF- 2030
009	94:1157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006655	MF- 2030
010	94:1158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006600	MF- 2030
010-Rev.1	94:1159	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006802	MF- 2030
011	94:1160	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006659	MF- 2030
013	94:1161	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006598	MF- 2030
014	94:1162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006654	MF- 2030
016	94:1163	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003858	MF- 2030
WHC-SD-W236A-TR- 001-Rev.1	94:1164	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010228	MF- 2030
WHC-SD-W236A-WP- 002	94:1165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006887	MF- 2030
WHC-SD-W236B-DRD- 001	94:1166	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007789	MF- 2020
WHC-SD-W236B-EV- 001-Rev.2	94:1167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006778	MF- 2030
WHC-SD-W236B-FRD- 001	94:1168	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018161	MF- 2030
002-Rev.1	94:1169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004146	MF- 2020
WHC-SD-W236B-SOW- 001	94:1170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000801	MF- 2030
WHC-SD-W236B-TI- 006	94:1171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010076	MF- 2020

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WHC-SD-W242-ES-003	94:833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003869	MF-2020
WHC-SD-W252-ACDR-001	94:322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006876	MF-2020
WHC-SD-W252-FDC-001-Rev.1	94:323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003838	MF-2000
WHC-SD-W272-HC-001-Rev.1	94:2769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007221	MF-2070
WHC-SD-W280-ATP-001	94:1172	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003220	MF-2030
WHC-SD-W296-SAD-001	94:2237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018509	MF-2000
WHC-SD-W302-FDC-001	94:1173	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008423	MF-2030
WHC-SD-W306-SDRD-001	94:834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005229	MF-2020
WHC-SD-W306-TI-003	94:835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005621	MF-2050
WHC-SD-W314-FRD-001	94:1175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006790	MF-2030
WHC-SD-W314-PLN-001	94:1176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003162	MF-2030
WHC-SD-W314B-DA-002	94:1174	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004424	MF-2030
WHC-SD-W320-ANAL-002	94:1177	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003241	MF-2030
003	94:1178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003363	MF-2030
WHC-SD-W320-CBA-001	94:1179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010077	MF-2030
WHC-SD-W320-DA-001	94:1180	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005289	MF-2030
004	94:1181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003280	MF-2030
005	94:1182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003278	MF-2030
006	94:1183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007788	MF-2030
WHC-SD-W320-PMP-001-Rev.2	94:1184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001310	MF-2030
001-Rev.3	94:1185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005298	MF-2030
WHC-SD-W320-QAPP-001-Rev.1	94:1186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004474	MF-2050
WHC-SD-W320-TC-002	94:1187	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002089	MF-2020
WHC-SD-W320-TIS-001	94:1188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001037	MF-2030

WHC-SD-W320-TIS-

<i>Report Number</i>	<i>Abstract Number</i>	<i>Source of Availability</i>	<i>GPO Dep.</i>	<i>Order Number</i>	<i>Distribution Category</i>
001-Rev.1	94:1189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003068	MF- 2020
001-Rev.2	94:1190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005214	MF- 2000
001-Rev.3	94:1191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010106	MF- 2030
WHC-SD-W320-TRP- 001	94:1192	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007787	MF- 2030
002	94:1193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008421	MF- 2030
WHC-SD-W337-ATP- 001	94:2770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004754	MF- 2070
WHC-SD-W337-OTP- 001	94:2771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005284	MF- 2070
WHC-SD-W340-ECOR- 001	94:1194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010079	MF- 2060; MF- 2030
WHC-SD-W340-ES- 002	94:1195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004785	MF- 2050; MF- 2030
WHC-SD-W340-SEL- 002	94:1196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000987	MF- 2030
WHC-SD-W340-WP- 002	94:1197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004498	MF- 2020
WHC-SD-W364-PMP- 001	94:836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001308	MF- 2030
WHC-SD-W370-ER- 001	94:837	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003863	MF- 2000
WHC-SD-W370-FDC- 001	94:838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003864	MF- 2000
WHC-SD-W378-ES- 001	94:839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001532	MF- 2020
WHC-SD-W378-SP- 001	94:840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002155	MF- 2020
WHC-SD-W402-CR- 001-Rev.1	94:1198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000351	MF- 2030
001-Rev.2	94:1199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006884	MF- 2030
WHC-SD-W402-FHA- 001	94:1200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005065	MF- 2030
WHC-SD-W405-CR- 001	94:2772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005144	MF- 2070
WHC-SD-W405-PD- 001	94:2773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003250	MF- 2020
002	94:2774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003232	MF- 2020
WHC-SD-W413-FHA- 001	94:1201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005073	MF- 2030

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WHC-SD-WM-ABU-001	94:1202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010073	MF-2030
WHC-SD-WM-ANAL-014	94:1203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018156	MF-2030
018	94:1204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002210	MF-2050
020-Rev.1	94:1205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003076	MF-2050
029	94:1206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010136	MF-2030
033-Vol.1	94:1207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018727	MF-2030
033-Vol.2	94:1208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018728	MF-2030
034-Vol.1	94:1209	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018467	MF-2030
034-Vol.2	94:1210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018468	MF-2030
035-Vol.1	94:1211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019003	MF-2030
035-Vol.2	94:1212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019004	MF-2030
036	94:1213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004157	MF-2030
037	94:2775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003087	MF-2000
038	94:2776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005605	MF-2000
039	94:2238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005975	MF-2030
040	94:2239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005991	MF-2070
043	94:1214	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006786	MF-2030
WHC-SD-WM-AP-005-Rev.5	94:1215	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005626	MF-2030
019-Rev.1	94:1216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001544	MF-2030
029	94:841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003279	MF-2020
030-Rev.1	94:2777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003840	MF-2020
031	94:1217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001376	MF-2030
033	94:842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005074	MF-2020
035	94:1218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010192	MF-2030
WHC-SD-WM-ATP-023-Rev.5	94:1219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001560	MF-2030
023-Rev.6	94:1220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003063	MF-2020
063-Rev.1	94:1221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010139	MF-2070
069-Rev.2	94:1222	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003158	MF-2030
077-Rev.2	94:1223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006907	MF-2030
080	94:1224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005081	MF-2030
082	94:1225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001373	MF-2030

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092	94:1226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003163	MF- 2020
093	94:1227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004510	MF- 2030
096	94:1228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019006	MF- 2030
098	94:1229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000680	MF- 2000
100	94:1230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002142	MF- 2030
102	94:2778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001045	MF- 2020
103	94:2779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001514	MF- 2000
104	94:2240	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000343	MF- 2070
105	94:2780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000678	MF- 2070
106	94:1231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005098	MF- 2030
107	94:1232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003276	MF- 2030
107-Rev.1	94:1233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005681	MF- 2030
108	94:2781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002116	MF- 2070
110	94:2782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003166	MF- 2000
111	94:2783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003081	MF- 2070
111-Rev.1	94:2784	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004419	MF- 2070
112	94:1234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003781	MF- 2030
113	94:1235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005989	MF- 2060
114	94:2785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004159	MF- 2030
115	94:2786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004155	MF- 2000
117	94:2787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004429	MF- 2070
119	94:1236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010070	MF- 2070
122	94:1237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005472	MF- 2030
124	94:1238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008881	MF- 2070
127	94:1239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010140	MF- 2070
WHC-SD-WM-ATR-					
044	94:1240	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002237	MF- 2030
057	94:1241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010197	MF- 2030
066	94:1242	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006828	MF- 2030
069-Rev.1	94:1243	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005076	MF- 2030
078	94:1244	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000349	MF- 2030
081	94:1245	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001543	MF- 2030
082	94:1246	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005293	MF- 2030
084	94:1247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000347	MF- 2030

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088	94:1248	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003071	MF- 2030
089	94:2788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018507	MF- 2000
094	94:1249	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009095	MF- 2030
098	94:1250	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002075	MF- 2030
103	94:1251	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003236	MF- 2000
110	94:2789	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005224	MF- 2030
112	94:1252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008807	MF- 2030
117	94:2241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005676	MF- 2050
WHC-SD-WM-CGA- 001	94:1253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010137	MF- 2030
WHC-SD-WM-CM- 002	94:2790	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005638	MF- 2000
008	94:1254	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000504	MF- 2030
011	94:1255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019005	MF- 2030
012	94:3070	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE95005163	MF- 2000
WHC-SD-WM-CMD- 001	94:1256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008885	MF- 2030
002	94:1257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008838	MF- 2030
003	94:1258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008834	MF- 2030
004	94:1259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009105	MF- 2030
WHC-SD-WM-CR- 057	94:1260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001309	MF- 2070
WHC-SD-WM-CSCM- 027	94:1261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002280	MF- 2030
WHC-SD-WM-CSD- 004	94:2791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001300	MF- 2070
WHC-SD-WM-CSDD- 004	94:1262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003780	MF- 2030
008-Rev.1	94:1263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018501	MF- 2030
014	94:1264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001592	MF- 2000
015	94:1265	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008044	MF- 2030
WHC-SD-WM-CSRS- 007-Rev.2	94:2792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008880	MF- 2070
016	94:1266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002146	MF- 2030
WHC-SD-WM-CSWD- 067	94:1267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003639	MF- 2000
069	94:1268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005596	MF- 2000

WHC-SD-WM-CSWL-

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WHC-SD-WM-CSWL- 002-Rev.2	94:1269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010597	MF- 2030
WHC-SD-WM-DA- 135	94:2242	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001231	MF- 2000
144	94:1270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004752	MF- 2030
157	94:1271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003052	MF- 2030
158	94:1272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008892	MF- 2030
159	94:1273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002158	MF- 2030
160	94:1274	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008477	MF- 2030
161	94:1275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001044	MF- 2030
162	94:1276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018504	MF- 2030
164	94:1277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003072	MF- 2030
165	94:1278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008464	MF- 2030
166	94:1279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003856	MF- 2030
167	94:1280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008462	MF- 2030
168	94:1281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008425	MF- 2030
169	94:1282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000983	MF- 2030
170	94:1283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001634	MF- 2030
173	94:1284	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003084	MF- 2030
177	94:2243	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003998	MF- 2000
179	94:1285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005433	MF- 2030
183	94:1286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005097	MF- 2030
187	94:1287	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011550	MF- 2030
188	94:2244	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010047	MF- 2030
WHC-SD-WM-DB- 024	94:1288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003083	MF- 2030
025	94:1289	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003849	MF- 2020
026	94:1290	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005431	MF- 2000
WHC-SD-WM-DCR- 002	94:2245	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003157	MF- 2000
WHC-SD-WM-DGS- 001	94:1291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002093	MF- 2030
WHC-SD-WM-DLP- 006	94:1292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011549	MF- 2030
WHC-SD-WM-DP- 0076	94:1300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003999	MF- 2070
065	94:1293	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005169	MF- 2070

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065-Add.1A	94:1294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007650	MF- 2070
067	94:1295	OSTI		TI95007412	ND- 2070
067-Add.1A	94:2793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007413	MF- 2070
068	94:2246	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003075	MF- 2070
068-Add.1A 069	94:2246 94:1296	See WHC-SD-WM-DP-068 OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000515	MF- 2070
071	94:1297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002115	MF- 2070
072	94:1298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010584	MF- 2070; MF- 2030
073	94:1299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005988	MF- 2030; MF- 2070
075	94:324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005283	MF- 2070; MF- 2030
077	94:1301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004371	MF- 2070
078	94:1302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005648	MF- 2070
079	94:1303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005412	MF- 2030
080	94:1304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005057	MF- 2070; MF- 2030
081	94:1305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005932	MF- 2020
082	94:1306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006789	MF- 2070
088	94:1307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000993	MF- 2000
089	94:1308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001542	MF- 2030
096	94:1309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009158	MF- 2070
097	94:1310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009140	MF- 2070
098	94:1311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009147	MF- 2070
099	94:1312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010043	MF- 2070; MF- 2030
100	94:1313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010596	MF- 2070
101	94:1314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010193	MF- 2070
102	94:1315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010592	MF- 2070
129	94:1316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009690	MF- 2070
WHC-SD-WM-DQO- 007	94:1317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001230	MF- 2030
011-Rev.1	94:1318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001570	MF- 2070
014	94:1319	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001434	MF- 2020

WHC-SD-WM-DRR-

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WHC-SD-WM-DRR- 047	94:1320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003070	MF- 2030
WHC-SD-WM-DTP- 033	94:1321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003074	MF- 2030
WHC-SD-WM-DTR- 025	94:1322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018459	MF- 2030
030	94:843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014630	MF-902
033	94:2794	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017996	MF- 2030
034	94:1323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018001	MF- 2030
036	94:1324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001375	MF- 2030
WHC-SD-WM-EE- 004-Rev.1	94:1325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008432	MF- 2030
WHC-SD-WM-EL- 003	94:1326	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008481	MF- 2030
WHC-SD-WM-EMP- 032	94:1327	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004364	MF- 2030
WHC-SD-WM-ER- 029-Rev.20	94:1328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003056	MF- 2030
308	94:1329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001898	MF- 2070
309	94:1330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001980	MF- 2070
310	94:1331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001983	MF- 2070
311	94:1332	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001900	MF- 2070;
312	94:1333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001901	MF- 2030
313	94:1334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001982	MF- 2070
323	94:1335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001979	MF- 2070
324	94:1336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001899	MF- 2070
325	94:1337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002233	MF- 2070
332	94:1338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004503	MF- 2020
333	94:325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003165	MF- 2030
343	94:1339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018152	MF- 2030
347	94:1340	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002240	MF- 2030
349	94:1341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004789	MF- 2030
351	94:1342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010037	MF- 2070
352	94:1343	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004790	MF- 2030
358	94:1344	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000530	MF- 2070
359	94:1345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000534	MF- 2070

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360	94:1346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001301	MF- 2070
361	94:1347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000526	MF- 2070
362	94:1348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001227	MF- 2070
363	94:1349	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001468	MF- 2070
364	94:1350	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001407	MF- 2070
365	94:1351	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001403	MF- 2070
367	94:1352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000466	MF- 2070
368	94:1353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001164	MF- 2070
369	94:1354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001405	MF- 2070
370	94:1355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001633	MF- 2070
372	94:1356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001632	MF- 2070
373	94:1357	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002208	MF- 2030
375	94:1358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003168	MF- 2020
377	94:1359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000308	MF- 2060
379	94:1360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002092	MF- 2030
380	94:1361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002370	MF- 2030
381	94:1362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001406	MF- 2030
382	94:1363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002095	MF- 2070
383	94:1364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006904	MF- 2030
386	94:1365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003274	MF- 2000
387	94:1366	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002091	MF- 2070
390	94:1367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003868	MF- 2000
391	94:1368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005429	MF- 2000
392	94:1369	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008479	MF- 2030
393	94:1370	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004365	MF- 2000
394	94:1371	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010229	MF- 2030
395	94:1372	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003766	MF- 2020
397	94:1373	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005143	MF- 2070
399	94:1374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018000	MF- 2030
399-Rev.	94:1375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005616	MF- 2020
402	94:1376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008414	MF- 2070
415	94:1377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008463	MF- 2030
417	94:1378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008884	MF- 2070

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431	94:1379	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010135	MF- 2030
WHC-SD-WM-ES-					
185	94:1380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019012	MF- 2030
288	94:2795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001567	MF- 2050
290	94:1381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012936	MF-902
290-Rev.2	94:1382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001232	MF- 2030
299	94:1383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000522	MF- 2030
300	94:1384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001511	MF- 2030
300-Rev.1	94:1385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005533	MF- 2030
303	94:1386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000984	MF- 2020
310	94:1387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003067	MF- 2020
311	94:1388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001512	MF- 2010
312	94:1389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003244	MF- 2030
313	94:2247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002209	MF- 2050
314	94:1390	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001595	MF- 2030; MF- 2060
316	94:1391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005430	MF- 2020
318	94:1392	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001371	MF- 2030
320	94:1393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001545	MF- 2030
328	94:1394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007179	MF- 2030
330	94:1395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005071	MF- 2050
333	94:2934	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010142	MF- 2030
334	94:1396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010738	MF- 2060
335	94:1397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008410	MF- 2030
336	94:1398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008418	MF- 2020
340	94:1399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010809	MF- 2030
349	94:1400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011689	MF- 2030
WHC-SD-WM-ETP-					
0106	94:1402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002236	MF- 2070
058	94:1401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007792	MF- 2030
107	94:1403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006895	MF- 2030
113	94:1404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000716	MF- 2050
115	94:1405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009146	MF- 2000
118	94:1406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004149	MF- 2000
119	94:1407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001038	MF- 2030

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122	94:1408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002076	MF- 2030
125	94:1409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005218	MF- 2030
128	94:1410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003771	MF- 2030
129	94:1411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003768	MF- 2030
135	94:1412	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006906	MF- 2030
137	94:1413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009098	MF- 2030
138	94:1414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007174	MF- 2070
143	94:1415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008411	MF- 2070; MF- 2030
146	94:1416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010049	MF- 2030
148	94:1417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010058	MF- 2030
150	94:1418	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010587	MF- 2030
WHC-SD-WM-EV- 014-Rev.2	94:2248	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004427	MF- 2010
025-Rev.1	94:2249	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002235	MF- 2000
053-Rev.2	94:1419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005079	MF- 2020
060-Rev.4	94:2796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001374	MF- 2070
073	94:2250	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000505	MF- 2020
096	94:844	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006888	MF- 2020
098	94:1420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002098	MF- 2030
WHC-SD-WM-FDC- 031	94:1421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002160	MF- 2030
032	94:1422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002159	MF- 2030
036	94:1423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006784	MF- 2030
036-Rev.1	94:1424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010095	MF- 2030
041	94:1425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005228	MF- 2020
042	94:1426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005601	MF- 2030
WHC-SD-WM-FHA- 003	94:2797	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005138	MF- 2050
005	94:1427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003085	MF- 2020
006	94:845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005625	MF- 2020
WHC-SD-WM-FRD- 019	94:1428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001561	MF- 2030
WHC-SD-WM-HC- 014	94:1429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010060	MF- 2030

WHC-SD-WM-HIE-

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WHC-SD-WM-HIE-003	94:1430	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002281	MF-2030
WHC-SD-WM-HSP-002-Rev.2	94:1431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010092	MF-2030
WHC-SD-WM-IP-007	94:2798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003281	MF-2020
WHC-SD-WM-ISB-003	94:2799	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010041	MF-2020
WHC-SD-WM-LL-006	94:1432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002279	MF-2030
WHC-SD-WM-MAR-001	94:1433	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019055	MF-2010
003	94:326	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001569	MF-2020
004	94:2800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005103	MF-2030
WHC-SD-WM-ML-001	94:846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009099	MF-2020
WHC-SD-WM-OMM-011	94:2251	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000799	MF-2030
015	94:1434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007188	MF-2030
016	94:1435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008894	MF-2030
WHC-SD-WM-OTP-151	94:1436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000503	MF-2030
158	94:1437	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000344	MF-2070
159	94:1438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000717	MF-2070
161	94:1439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004422	MF-2030
163	94:1440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003996	MF-2000
164	94:1441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003164	MF-2030
165	94:1442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003997	MF-2030
167	94:1443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004501	MF-2030
168	94:1444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004751	MF-2060
169	94:2252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006788	MF-2000
170	94:2801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005980	MF-2050
171	94:327	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005627	MF-2050
172	94:2253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005674	MF-2050
WHC-SD-WM-OTR-148	94:1445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010072	MF-2030
151	94:1446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010141	MF-2030
153	94:1447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003252	MF-2030

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155	94:1448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003282	MF-2050
156	94:2802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010195	MF-2000
163	94:2254	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004499	MF-2050
170	94:2255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005986	MF-2050
172	94:2256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006903	MF-2050
WHC-SD-WM-PAP-60	94:1449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002368	MF-2020
WHC-SD-WM-PC-002-Rev.6	94:1450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002211	MF-2030
WHC-SD-WM-PCP-009	94:1451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000341	MF-2030
WHC-SD-WM-PE-053	94:1452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001631	MF-2020
054	94:1453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011663	MF-2020
WHC-SD-WM-PICD-001	94:847	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003271	MF-2000
002	94:2803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016434	MF-940
004	94:2257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003069	MF-2020
006	94:2258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005977	MF-2020
WHC-SD-WM-PLN-055-Rev.2	94:2804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005636	MF-2070
071	94:848	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005142	MF-2070
072-Rev.1	94:1454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003251	MF-2030
076	94:1455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000516	MF-2020
081-Rev.3	94:1456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003867	MF-2020
090	94:849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002369	MF-2020
091	94:1457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010086	MF-2030
092	94:1458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001645	MF-2030
096	94:328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006896	MF-2000
WHC-SD-WM-PMP-014	94:2805	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001411	MF-2070
WHC-SD-WM-PROC-009-Rev.1	94:2806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003841	MF-2000
014	94:850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010083	MF-2070
018	94:1459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009150	MF-2030
019	94:1460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009153	MF-2030
WHC-SD-WM-PRS-014	94:2807	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001435	MF-2050

WHC-SD-WM-PSE-

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WHC-SD-WM-PSE-010	94:1461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003277	MF-2030
WHC-SD-WM-PTR-011	94:2808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012392	MF-901; MF-902
013	94:1462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008476	MF-2030
WHC-SD-WM-QAPP-009-Rev.1	94:1463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003843	MF-2070
018-Rev.1	94:1464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010084	MF-2030
029	94:1465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002145	MF-2030
030	94:1466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002161	MF-2030
WHC-SD-WM-RA-010	94:851	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016466	MF-902
WHC-SD-WM-RD-038-Rev.1	94:1467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001984	MF-2030
049	94:1468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004153	MF-2020
052	94:852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008409	MF-2020
053	94:1469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008039	MF-2030
WHC-SD-WM-RPT-060	94:853	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014483	MF-900
087	94:1470	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002239	MF-2020
093	94:1471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001378	MF-2010
096	94:2809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000462	MF-2070
098	94:1472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008431	MF-2070
099	94:854	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004500	MF-2020
099-Rev.1	94:855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005135	MF-2020
102	94:1473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010087	MF-2030
104	94:1474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010599	MF-2030
105	94:1475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005673	MF-2030
107	94:1476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010048	MF-2030
118	94:2810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009156	MF-2000
137	94:1477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010588	MF-2070
139	94:1891	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010050	MF-2040
WHC-SD-WM-SAD-016-Rev.2	94:1478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005437	MF-2030
025-Rev.2	94:856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010113	MF-2000
WHC-SD-WM-SAR-064	94:1479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001836	MF-2030
WHC-SD-WM-SARR-012-Rev.1	94:1480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004755	MF-2030

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028	94:857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000438	MF-2020
031	94:1481	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006909	MF-2030
034	94:1482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009155	MF-2030
WHC-SD-WM-SD-019	94:1483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002077	MF-2030
WHC-SD-WM-SDD-024	94:1484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005287	MF-2030
025	94:1485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001636	MF-2020
027	94:1486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002087	MF-2020
041	94:2811	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005474	MF-2000
043	94:1487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005684	MF-2030
045	94:1488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018436	MF-2030
048	94:1489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005225	MF-2030
049	94:1490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001556	MF-2030
054	94:1491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005677	MF-2030
055	94:1492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006652	MF-2030
WHC-SD-WM-SDP-011	94:2812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004486	MF-2000
WHC-SD-WM-SDRR-001	94:1493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010080	MF-2030
WHC-SD-WM-SEL-012-Rev.4	94:858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005679	MF-2020
033-Rev.1	94:1494	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004112	MF-2050
036	94:859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003080	MF-2020
WHC-SD-WM-SOIL-001	94:1495	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005299	MF-2030
WHC-SD-WM-SP-001	94:1496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016460	MF-940
006	94:1497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005619	MF-2030
008	94:2813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008025	MF-2030
010	94:2814	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010042	MF-2000
WHC-SD-WM-SSP-005	94:1498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001521	MF-2050
WHC-SD-WM-SWD-015	94:2815	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002242	MF-2070
033	94:2816	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018465	MF-2000
WHC-SD-WM-TA-154	94:1499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005052	MF-2030
156	94:1500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004747	MF-2030

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157	94:1501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003248	MF- 2030
158	94:1502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002078	MF- 2030
159	94:1503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005282	MF- 2030
160	94:1504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009100	MF- 2030
161	94:2817	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010063	MF- 2000
WHC-SD-WM-TC-					
005	94:1505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005290	MF- 2030
054	94:2818	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005682	MF- 2000
062	94:1506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000463	MF- 2000
066	94:1507	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003845	MF- 2070
WHC-SD-WM-TI-					
363	94:1508	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005597	MF- 2030
386	94:1509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005077	MF- 2030
399-Rev.2	94:860	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001404	MF- 2000
404-Rev.3	94:861	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001530	MF- 2020
540	94:1510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013578	MF-940
540-Rev.1	94:1511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004432	MF- 2070
573-Rev.1	94:1512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008042	MF- 2030
577-Rev.1	94:1513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003270	MF- 2020
591	94:1514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000461	MF- 2030
594-Rev.1	94:1515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001513	MF- 2000
607	94:2819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018151	MF- 2020
608-Rev.1	94:2820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004490	MF- 2070
616	94:2259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000348	MF- 2010
623	94:1516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018681	MF- 2030
624	94:862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013575	MF-940
633	94:1517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003161	MF- 2030
634-Rev.1	94:1518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004496	MF- 2030
638	94:1519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005101	MF- 2030
643	94:2935	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001408	MF- 2030
645	94:1520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002090	MF- 2070
646	94:1521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019009	MF- 2010
648	94:1522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001638	MF- 2070
650	94:1523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000674	MF- 2070

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651	94:1524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000310	MF- 2030; MF- 2070
652	94:1525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001409	MF- 2070
653	94:1526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000675	MF- 2070
654	94:2821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001237	MF- 2000
656	94:1527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001537	MF- 2030
656-Rev.1	94:1528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005216	MF- 2030
657	94:1529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010069	MF- 2030
658	94:1530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001034	MF- 2070
659	94:2822	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001030	MF- 2000
661	94:1531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002084	MF- 2070
664	94:1532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001377	MF- 2070
665	94:1533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006902	MF- 2030
666	94:1534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004502	MF- 2030
667	94:1535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005281	MF- 2030
668	94:1536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003156	MF- 2030
672	94:2823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003847	MF- 2000
674	94:1537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006908	MF- 2070
675	94:2260	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE95005168	MF- 2050
677	94:1538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008048	MF- 2030
680	94:2824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005051	MF- 2070
682	94:1539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006894	MF- 2030
685	94:2825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008413	MF- 2050
686	94:863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008832	MF- 2020
692	94:1540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010590	MF- 2030
693	94:1541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010081	MF- 2030
WHC-SD-WM-TP- 147	94:1542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005595	MF- 2030
163	94:329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002111	MF- 2070
164	94:330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000353	MF- 2000
165	94:331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002241	MF- 2070
180	94:1543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005623	MF- 2050
193	94:1544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004150	MF- 2010

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200	94:1545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006826	MF- 2070
206	94:1546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004977	MF- 2030; MF- 2070
207	94:1547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002080	MF- 2070
207-Rev.1	94:1548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006890	MF- 2070
216	94:1549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007218	MF- 2070
217-Rev.1	94:1550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006897	MF- 2070
218-Rev.1	94:1551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006777	MF- 2070
219-Rev.1	94:1552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002118	MF- 2070
219-Rev.2	94:1553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005146	MF- 2030
227	94:1554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000523	MF- 2030
227-Rev.1	94:1555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006891	MF- 2070
228	94:1556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007196	MF- 2070
229	94:1557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004000	MF- 2070
231	94:1558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003275	MF- 2070
231-Rev.1	94:1559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008478	MF- 2070
240	94:1560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008874	MF- 2070
241	94:1561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005436	MF- 2030; MF- 2070
243	94:1562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000464	MF- 2030
247	94:1563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001305	MF- 2070
249	94:1564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007217	MF- 2070
250	94:1565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006905	MF- 2070
254	94:1566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005475	MF- 2030
257	94:1567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001709	MF- 2030
259	94:1568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003062	MF- 2070
259-Rev.1	94:1569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008883	MF- 2070
263	94:1570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001039	MF- 2020
265	94:1571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018508	MF- 2000
266	94:1572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003944	MF- 2020
267	94:1573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000432	MF- 2020
268	94:1574	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005639	MF- 2030
271	94:1575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002094	MF- 2070

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273	94:1576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003246	MF- 2070
274	94:1577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003223	MF- 2070
275	94:1578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003249	MF- 2070
276	94:1579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003229	MF- 2070
277	94:1580	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003769	MF- 2070
277-Rev.1	94:1581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003848	MF- 2070
279	94:1582	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003079	MF- 2070
280	94:1583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003842	MF- 2070
281	94:1584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003078	MF- 2070
283	94:1585	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010082	MF- 2030
284	94:1586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007195	MF- 2070
285	94:1587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005132	MF- 2030
285-Rev.1	94:1588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009145	MF- 2070
286	94:1589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005296	MF- 2030; MF- 2070
286-Rev.1	94:1590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005978	MF- 2030
288	94:1591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006898	MF- 2070
289	94:1592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007793	MF- 2070
290	94:1593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007175	MF- 2070
293	94:1594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004978	MF- 2030
294	94:1595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005604	MF- 2030
295	94:1596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005637	MF- 2070
296	94:1597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005070	MF- 2070
297	94:1598	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95008045	MF- 2030
298	94:1599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005976	MF- 2070
299	94:1600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010085	MF- 2030
300	94:1601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010071	MF- 2070
301	94:1602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008043	MF- 2030; MF- 2070
302	94:1603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007180	MF- 2070
304	94:1604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008895	MF- 2070
305	94:1605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008876	MF- 2070
306	94:1606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008877	MF- 2070

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307	94:1607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008889	MF-2030
308	94:1608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008416	MF-2070
309	94:1609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008415	MF-2070
310	94:1610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010138	MF-2070
311	94:1611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010101	MF-2070
312	94:1612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008417	MF-2070
313	94:1613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008804	MF-2070
314	94:1614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008837	MF-2070; MF-2030
317	94:1615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008878	MF-2070
324	94:1616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010808	MF-2070
330	94:2826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010807	MF-2070
335	94:1617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010940	MF-2070
338	94:1618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010078	MF-2070
349	94:1619	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010589	MF-2070
WHC-SD-WM-TPI- 016-Rev.2	94:1620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001410	MF-2030
016-Rev.3	94:1621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005145	MF-2030
017	94:1622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000457	MF-2030
WHC-SD-WM-TPP- 052	94:2261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000736	MF-2050
WHC-SD-WM-TR- 024-Rev.1	94:3071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003228	MF-2000
WHC-SD-WM-TRP- 105-Rev.5	94:1623	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000533	MF-2030
105-Rev.6	94:1624	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000352	MF-2030
106-Rev.5	94:1625	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000454	MF-2030
106-Rev.6	94:1626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000337	MF-2030
107-Rev.5	94:1627	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000453	MF-2030
107-Rev.6	94:1628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000340	MF-2030
108-Rev.4	94:1629	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000452	MF-2030
109-Rev.4	94:1630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000451	MF-2030
109-Rev.5	94:1631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000339	MF-2030
111-Rev.5	94:1632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001233	MF-2030
112-Rev.5	94:1633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001236	MF-2030

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113-Rev.4	94:1634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001235	MF- 2030
113-Rev.5	94:1635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000311	MF- 2030
114-Rev.5	94:1636	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001228	MF- 2030
114-Rev.6	94:1637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000306	MF- 2030
197	94:2827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003854	MF- 2000
201	94:1638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001234	MF- 2030
202	94:1639	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001163	MF- 2030
208	94:1640	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003773	MF- 2030
209	94:1641	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000309	MF- 2030
211	94:1642	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005979	MF- 2030
212	94:2828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006761	MF- 2070
215	94:1643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001372	MF- 2030
218	94:1644	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001574	MF- 2030
220	94:864	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002367	MF- 2020
223	94:1645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009159	MF- 2030
225	94:1646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008424	MF- 2030
227	94:2829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008036	MF- 2000
229	94:1647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005987	MF- 2030
230	94:1648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010102	MF- 2070
236	94:2830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011803	MF- 2030
WHC-SD-WM-TS- 005	94:2831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001029	MF- 2020
WHC-SD-WM-UM- 019	94:2262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006889	MF- 2000
027	94:2832	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005473	MF- 2000
029	94:1649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005147	MF- 2070
WHC-SD-WM-VI- 011	94:865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005434	MF- 2020
014	94:866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005624	MF- 2020
015	94:867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009142	MF- 2020
017	94:1650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008412	MF- 2030
018	94:1651	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009141	MF- 2020
WHC-SD-WM-WP- 072-Rev.3	94:1652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002097	MF- 2030
132-Rev.4	94:1653	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001515	MF- 2030

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132-Rev.5	94:1654	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010059	MF-2030
174-Rev.1	94:1655	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002157	MF-2070
218-Rev.1	94:1656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005990	MF-2030
245-Rev.1	94:868	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002143	MF-2030
264	94:1657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002074	MF-2000
283	94:1658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000502	MF-2000
284	94:1659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004971	MF-2030
285	94:1660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001004	MF-2030
286	94:2833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003058	MF-2000
287	94:1661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002459	MF-2030
289	94:1662	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003226	MF-2000
289-Rev.1	94:1663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003992	MF-2000
291	94:1664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004101	MF-2030
293	94:2834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005072	MF-2050
295	94:1665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006787	MF-2020
301	94:1666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010591	MF-2030
WHC-SP-					
0564-33	94:2263	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014631	MF-607
0665-14	94:869	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003213	MF-2000
0665-15	94:870	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007187	MF-2070
0841-Rev.2	94:2264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010110	MF-2000
0849	94:2265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008791	MF-2000
0903-Rev.1	94:2266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002461	MF-2000
0992-1	94:871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014580	MF-940
1009-Rev.1	94:872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001985	MF-2070
1011D-Draft	94:2835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011455	MF-901
1094-FY94	94:2267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018159	MF-2050
1096	94:3072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001249	MF-2000
1097	94:332	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001844	MF-2000
1098	94:3073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018162	MF-2080
1101-Vol.1	94:1667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001023	MF-2030
1101-Vol.2	94:1668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001024	MF-2030
1101-Vol.3	94:1669	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001025	MF-2030
1101-Vol.4	94:1670	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001026	MF-2030
1101-Vol.5	94:1671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001027	MF-2030

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1104	94:2836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001402	MF- 2000
1108	94:2268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004976	MF- 2020
1109	94:3074	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001316	MF- 2000
1110	94:2837	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003047	MF- 2000
1112	94:2269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005598	MF- 2000
1114	94:2838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003264	MF- 2020
1115	94:2839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001298	MF- 2000
1116	94:2270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001577	MF- 2000
1119	94:2840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002107	MF- 2000
1122-Vol.1	94:2841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002837	MF- 2000
1122-Vol.2	94:2842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002838	MF- 2000
1122-Vol.3	94:2843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002839	MF- 2000
1122-Vol.4	94:2844	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002840	MF- 2000
1124	94:333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001576	MF- 2080
1126-Vol.1	94:2271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001821	MF- 2050
1126-Vol.2	94:2272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001822	MF- 2050
1126-Vol.3	94:2273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001823	MF- 2050
1126-Vol.4	94:2845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001824	MF- 2050
1137	94:1672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001528	MF- 2030
1139	94:2274	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005635	MF- 2000
1142	94:2846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002968	MF- 2020
1143	94:1673	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008029	MF- 2030
1147	94:2275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007185	MF- 2050
1149	94:2276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005599	MF- 2070
1154	94:2277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010112	MF- 2000
2332	94:1674	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013232	MF-940
WIN- 306-Rev.1	94:2851	See WINCO-1209			
WINCO- 1123-Rev.1	94:2278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013373	MF-902
1138	94:2279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013802	MF-940
1160	94:2847	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013370	MF-906
1162	94:2848	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013805	MF-940
1168	94:2280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013806	MF-940
1175	94:1675	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013369	MF-906
1188	94:2281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013807	MF-940
1190	94:2282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013808	MF-940
1199	94:2849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013809	MF-940
1206	94:2850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015532	MF-940
1209	94:2851	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013672	MF-902
1210	94:2852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013673	MF-940
1211	94:873	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014944	MF-902
1212	94:1676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013810	MF-940

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1213	94:2853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014039	MF-940
1214	94:874	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000775	MF-2010
1216	94:2854	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014046	MF-940
1217	94:2855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000587	MF-2050
1218	94:2856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016421	MF-940
1221	94:2283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019088	MF-2030
1222	94:2857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018511	MF-2050
1223	94:2858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019089	MF-2000
1224	94:2284	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000832	MF-2050
1226	94:2285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000776	MF-2070
1228	94:2286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000777	MF-2060
1229	94:2859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000778	MF-2070
WSRC-MS-					
94-008	94:2361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006379	MF-940
94-0197	94:2936	OSTI; NTIS; GPO Dep.	E 1.99:	DE94010819	MF-721
94-0203P	94:2937	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005885	MF-721
94-0211	94:1677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019063	MF-2060
94-0214P	94:2938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016693	MF-721
94-0252	94:334	OSTI; NTIS; GPO Dep.	E 1.99:	DE94013224	MF-702
94-0308	94:875	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013290	MF-721
94-0323	94:335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013289	MF-902
94-0327	94:336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013284	MF-721
94-0341	94:337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015548	MF-721
94-0409	94:1678	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017543	MF-721
94-0499	94:2363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000532	MF-2060
94-0567	94:2860	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003906	MF-2000
94-0569	94:876	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003460	MF-2020
94-0590	94:2861	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005006	MF-2020
94-0595	94:2287	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005485	MF-2050
94-0617	94:2862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006455	MF-2000
94-0618	94:2863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006454	MF-2000
94-0619	94:2864	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006456	MF-2000
94-0658	94:2364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006463	MF-721
94-0662	94:877	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060103	MF-2020
94-069	94:2362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007186	MF-706
95-0010	94:2865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005482	MF-2030
95-0012	94:878	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060083	MF-2020
95-0028	94:879	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060087	MF-2070
95-0056	94:880	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060091	MF-2020
95-0057	94:2866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060092	MF-2070
95-0115	94:1679	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060106	MF-2030

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WSRC-RP- 90-1127	94:1680	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005483	MF-2070
94-00062	94:881	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018732	MF-721
94-00780	94:882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004344	MF-702
94-1272	94:2939	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005881	MF-721
94-146	94:1681	OSTI; NTIS; GPO Dep.	E 1.99:	DE94009275	MF-701
94-276	94:338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014868	MF-703
94-396	94:2867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005484	MF-2070
94-532	94:2868	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006474	MF-2020
94-584	94:2869	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060080	MF-2020
94-585	94:2870	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060081	MF-2020
94-607	94:339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94016536	MF-703
95-0040	94:2871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005480	MF-2030
WSRC-TR- 93-454	94:2940	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015556	MF-711
93-540-Vol.1	94:340	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014274	MF-702
93-540-Vol.2	94:341	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014275	MF-702
93-540-Vol.3	94:342	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014276	MF-702
93-540-Vol.4	94:343	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014277	MF-702
93-762	94:883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001476	MF-2020
94-0269	94:2941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015549	MF-721
94-0286	94:2942	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017805	MF-2030
94-0286-E-Rev.1	94:344	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004410	MF-700
94-0286-ESS	94:345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000499	MF-702
94-0287	94:2943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000759	MF-721
94-0296	94:2872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001465	MF-2070
94-0328	94:3075	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016694	MF-900
94-0346	94:346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002697	MF-2010
94-0347	94:347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002698	MF-2010
94-0348	94:348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002696	MF-2010
94-0368-Rev.2	94:1682	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010957	MF-2030
94-0387	94:349	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002685	MF-702
94-0425	94:350	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001473	MF-703
94-0538	94:2288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005481	MF-2050
94-0544	94:351	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005486	MF-2010
94-0554-Rev.1	94:2289	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010956	MF-706
94-0577	94:2873	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060102	MF-2030
95-0039	94:884	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010973	MF-2020
95-0108	94:1683	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060105	MF-2030
WTD- 92-046	94:885	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009462	MF-2020
Y/ER- 105/V1-D2	94:537	See DOE/OR-01-1161/V1-D2			
105/V1-D2/A1	94:538	See DOE/OR-01-1161/V1-D2/A1			
112-D2	94:1958	See DOE/OR-01-1173-D2			
158	94:2290	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001769	MF-2050
159/V1	94:2291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009067	MF-2050

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159/V3/Pt.A	94:2292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009068	MF-702; MF- 2050
159/V3/Pt.B	94:2293	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009069	MF-702; MF- 2050
172/V2-D1	94:1960	See DOE/OR-01-1268/V2-D1			
182/V1-D1	94:1961	See DOE/OR-01-1273/V1-D1			
182/V1-D2	94:1962	See DOE/OR-01-1273/V1-D2			
182/V2-D1	94:1963	See DOE/OR-01-1273/V2-D1			

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The correlation list is provided for those organizations that file documents by report number but may receive requests by order number. For more information about a document, refer to the Report Number Index.

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DE93016145	ORNL/M-2751/V1/Pt.B	DE94010685	LA-12733-MS-Vol.1	DE94013232	WHC-SP-2332
DE93016167	ORNL/M-2751/V3/Pt.A	DE94010686	LA-12733-MS-Vol.2	DE94013250	WHC-SA-2162
DE93016168	ORNL/M-2751/V3/Pt.B	DE94010706	EGG-WM-10924	DE94013253	CONF-940386-4
DE93016169	ORNL/M-2751/V3/Pt.C	DE94010710	EGG-CEE-10883	DE94013263	CONF-940789-1
DE94004079	DOE/MC/29104-3662	DE94010711	EGG-WTD-10973	DE94013265	CONF-9309139-12
DE94004105	DOE/MC/29120-3717	DE94010713	EGG-WTD-10942	DE94013269	CONF-940406-13
DE94004107	DOE/MC/29105-3719	DE94010756	SAND-94-1145C	DE94013271	CONF-9405159-2
DE94004143	DOE/MC/29467-3778	DE94010819	WSRC-MS-94-0197	DE94013281	CONF-940225-114
DE94005524	DOE/RL-91-36-Rev.2	DE94011010	LBL-35312	DE94013284	WSRC-MS-94-0327
DE94006204	ORNL-6769	DE94011029	SAND-94-1119C	DE94013289	WSRC-MS-94-0323
DE94006379	WSRC-MS-94-008	DE94011138	PNL-9412	DE94013290	WSRC-MS-94-0308
DE94007186	WSRC-MS-94-069	DE94011163	RFP-4810	DE94013321	PNL-SA-23972
DE94007297	SAND-94-0105C	DE94011337	WHC-EP-0722-Add.2	DE94013324	PNL-SA-24139
DE94007315	ORNL/TM-12660	DE94011339	WHC-EP-0722	DE94013325	PNL-SA-24094
DE94007556	LA-UR-94-688	DE94011350	LBL-35186	DE94013342	SAND-94-1444C
DE94007689	ANL/EA/CP-81120	DE94011352	LBL-35134	DE94013369	WINCO-1175
DE94007739	SAND-94-0715C	DE94011399	WHC-MR-0455	DE94013370	WINCO-1160
DE94007854	SAND-94-0513C	DE94011403	PNL-9411	DE94013373	WINCO-1123-Rev.1
DE94007920	DOE/CH-9303	DE94011434	PNL-9446	DE94013406	ORNL/TM-12751
DE94007933	SAND-94-0482C	DE94011436	SAND-94-1003C	DE94013454	PNL-9336
DE94008103	ANL/EA/CP-80973	DE94011438	PNL-8902	DE94013523	RFP-4831
DE94008235	PNL-9387	DE94011452	WHC-EP-0579	DE94013550	EGG-11265-3004
DE94008526	EGG-WM-11105	DE94011455	WHC-SP-1011D-Draft	DE94013573	WHC-SA-2077
DE94008528	CONF-9308217-	DE94011467	CONF-940815-5	DE94013575	WHC-SD-WM-TI-624
DE94008555	ORNL/ER-216	DE94011508	ANL/CMT/CP-81046	DE94013578	WHC-SD-WM-TI-540
DE94008605	CONF-940225-78	DE94011624	LBL-35384	DE94013579	DOE/RL-94-45
DE94008608	CONF-940225-75	DE94011627	SAND-94-8002	DE94013580	DOE/RL-94-21
DE94008615	SAND-94-0716C	DE94011757	UCRL-JC-113790-Rev.2	DE94013583	WHC-SA-2425
DE94008617	SAND-94-0676C	DE94012113	CONF-940859-19	DE94013585	WHC-SA-2460
DE94008620	DOE/EM-0140P	DE94012244	PNL-SA-23742	DE94013603	DOE/OR-01-1193-D2
DE94008667	PNL-9053	DE94012392	WHC-SD-WM-PTR-011	DE94013612	LA-SUB-94-84
DE94008707	KCP-613-5329	DE94012401	WHC-SA-1987	DE94013634	CONF-9405167-1
DE94008732	PNL-9335	DE94012457	ANL/RE/CP-82146	DE94013643	LA-12783-MS
DE94008734	PNL-SA-22803	DE94012462	ANL/RE/CP-82360	DE94013665	DOE/MC/29107-94/C0341
DE94008869	SAND-94-0750C	DE94012501	FEMP/SUB-084	DE94013672	WINCO-1209
DE94008923	SAND-94-0764C	DE94012503	PNL-SA-22987	DE94013673	WINCO-1210
DE94008952	SAND-94-0595C	DE94012510	DOE/EM-0148P	DE94013802	WINCO-1138
DE94009062	SAND-94-0786C	DE94012587	UCRL-ID-115754	DE94013805	WINCO-1162
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DE94009204	DOE/OR-01-1109	DE94012663	CONF-940859-20	DE94013808	WINCO-1190
DE94009275	WSRC-RP-94-146	DE94012904	LA-UR-94-1749	DE94013809	WINCO-1199
DE94009285	SAND-94-0596C	DE94012926	LA-UR-94-1735	DE94013810	WINCO-1212
DE94009306	LA-UR-94-718	DE94012932	WHC-SD-EN-AP-151-Rev.1	DE94013827	CONF-940815-37
DE94009326	LA-UR-94-1093	DE94012933	WHC-SD-EN-DP-082	DE94013828	CONF-940815-38
DE94009347	LA-UR-94-981	DE94012936	WHC-SD-WM-ES-290	DE94013871	ANL/CMT-ACL/CP-83255
DE94009359	LA-UR-94-924	DE94012937	WHC-SD-EN-AP-117	DE94013880	WHC-SA-2355
DE94009361	LA-UR-94-930	DE94013001	LA-UR-94-1658	DE94013881	WHC-MR-0452-Add.1
DE94009473	DOE/OR-23701-41.1	DE94013006	WHC-SD-EN-TI-240	DE94013882	WHC-MR-0452
DE94009614	WHC-SD-EN-TI-203	DE94013007	WHC-EP-0707	DE94013958	PNL-9814
DE94009687	ANL/CMT/CP-81910	DE94013008	WHC-SA-2347	DE94013959	PNL-9791
DE94009980	SAND-93-7058	DE94013013	WHC-SD-EN-AP-168	DE94013968	WHC-EP-0756
DE94010073	ANL-93/45	DE94013196	ORNL/TM-12714	DE94013971	WHC-EP-0718
DE94010336	DOE/RL-94-14	DE94013199	LA-12789-MS	DE94013972	WHC-SA-2435
DE94010368	WHC-SD-EN-TI-211	DE94013208	DOE/MC/29113-3766-Pt.1	DE94013977	PNL-9409
DE94010416	DOE/AL/65779-T1	DE94013224	WSRC-MS-94-0252	DE94013979	LA-12799-PR
DE94010463	ANL/CMT/CP-81057	DE94013227	WHC-SA-2406	DE94013982	DOE/MWIP-16
DE94010660	SAND-93-0808	DE94013228	WHC-SA-2481	DE94013983	ORNL/GWPO-005
DE94010676	DOE/EW/53023-T5-Exec.Summ.	DE94013230	WHC-SA-1787	DE94014015	ANL/CMT/CP-82030
		DE94013231	WHC-SA-2268	DE94014018	CONF-940815-48

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DE94014029	ORNL/ER-218	DE94014580	WHC-SP-0992-1	DE94015419	LA-SUB-94-88
DE94014030	DOE/OR-01-1117/V4	DE94014581	WHC-EP-0182-71	DE94015420	LA-SUB-94-17
DE94014031	DOE/OR-01-1226/V2	DE94014629	WHC-SA-2335	DE94015425	DOE/MWIP-29
DE94014038	DOE/EM-0169P	DE94014630	WHC-SD-WM-DTR-030	DE94015451	DOE/MWIP-20
DE94014039	WINCO-1213	DE94014631	WHC-SP-0564-33	DE94015530	SAND-93-7066
DE94014046	WINCO-1216	DE94014635	WHC-EP-0474-10	DE94015532	WINCO-1206
DE94014051	DOE/MWIP-17	DE94014636	WHC-SA-2433	DE94015548	WSRC-MS-94-0341
DE94014052	DOE/OR-1001/R3	DE94014637	WHC-SA-2413	DE94015549	WSRC-TR-94-0269
DE94014096	DOE/OSTI-3411	DE94014638	WHC-SA-2452	DE94015556	WSRC-TR-93-454
DE94014104	CONF-940815-43	DE94014639	WHC-EP-0766	DE94015594	ANL/EAD/LD-2
DE94014107	CONF-940815-45	DE94014717	LA-UR-94-1452	DE94015597	SAND-93-0681
DE94014113	WHC-SD-EN-AP-159	DE94014729	UCRL-JC-116577	DE94015635	ORNL/TM-12710
DE94014115	WHC-EP-0777	DE94014812	LA-UR-94-1703	DE94015637	WHC-SA-2241
DE94014117	WHC-SD-EN-TI-234	DE94014868	WSRC-RP-94-276	DE94015645	WHC-SD-EN-TI-267
DE94014118	WHC-SA-2393	DE94014873	DOE/MC/30171-94/C0344	DE94015648	DOE/RL-93-79
DE94014119	WHC-SD-EN-TP-044	DE94014933	DOE/EM-0172P	DE94015649	WHC-SD-EN-TI-279
DE94014120	WHC-SD-EN-RPT-009	DE94014943	UCRL-ID-110052	DE94015661	WHC-EP-0769
DE94014121	WHC-SA-2453	DE94014944	WINCO-1211	DE94015662	WHC-EP-0722-Add.3-Draft
DE94014123	WHC-SD-EN-ES-040	DE94014992	PNL-8996	DE94015669	WHC-SA-2358
DE94014125	WHC-SD-EN-RPT-010	DE94014995	PNL-SA-23055	DE94015670	DOE/RL-93-29
DE94014126	DOE/RL-93-105	DE94015000	PNL-SA-23330	DE94015671	WHC-SD-EN-RA-010
DE94014127	WHC-SA-2282	DE94015010	ORNL/TM-12770	DE94015672	WHC-SD-EN-TI-245
DE94014128	WHC-SD-EN-RPT-011	DE94015030	ANL/CMT/CP-82133	DE94015706	WHC-SD-EN-AP-166
DE94014138	LA-12782-MS	DE94015031	ANL/ET/CP-82151	DE94015707	WHC-SA-2317
DE94014144	DOE/ID/13042-37	DE94015032	ANL/CMT/CP-82761	DE94015708	WHC-SA-2516
DE94014158	DOE/ID/12735-T30	DE94015035	ANL/CMT/CP-83184	DE94015710	WHC-SA-2478
DE94014168	DOE/MC/29116-3799	DE94015036	ANL/CMT/CP-83059	DE94015713	DOE/RL-93-99
DE94014239	IS-5090	DE94015037	ANL/EA/CP-82126	DE94015724	WHC-SD-EN-TI-213
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DE94014254	DOE/WIPP-94-006	DE94015062	ANL/TD/CP-83100	DE94015753	WHC-SA-2377
DE94014268	WHC-EP-0768	DE94015074	ANL/EWM/CP-82897	DE94015754	WHC-SD-EN-TI-242
DE94014270	WHC-SD-EN-TI-268	DE94015087	ANL/CMT/CP-82156	DE94015755	WHC-SA-2016
DE94014274	WSRC-TR-93-540-Vol.1	DE94015090	ANL/EWM/CP-82955	DE94015756	WHC-SD-EN-TI-248
DE94014275	WSRC-TR-93-540-Vol.2	DE94015094	ANL/EA/CP-83307	DE94015758	DOE/RL-94-23
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DE94014283	SAND-94-1070C	DE94015194	PNL-9821	DE94015808	FEMP-2320
DE94014290	LA-UR-94-2018	DE94015205	PNL-SA-24419	DE94015810	FEMP-2329
DE94014291	LA-UR-94-2019	DE94015207	PNL-SA-24432	DE94015812	FEMP-2314
DE94014294	LA-UR-94-2017	DE94015212	PNL-SA-23487	DE94015813	FEMP-2330
DE94014295	LA-UR-94-2016	DE94015233	DOE/MC/29467-3807-Pt.2	DE94015814	FEMP-2324
DE94014298	DOE/EM-0156T	DE94015255	EGG-WROC-11152	DE94015934	ORNL/TM-12759
DE94014352	UCRL-ID-111766	DE94015260	EGG-WTD-11199	DE94015937	DOE/OR-01-1252-D1
DE94014398	DOE/EA-0464-Rev.4	DE94015261	EGG-WTD-11271	DE94015939	ORNL/ER-202
DE94014399	DOE/AL/62350-68F-Rev.3	DE94015265	EGG-WTD-11161	DE94015940	DOE/OR-01-1194-D2
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DE94014407	DOE/AL/62350-31F	DE94015316	EGG-MS-10941	DE94016188	LA-UR-94-2664
DE94014408	WHC-SD-EN-TP-043	DE94015319	EGG-NRE-11236	DE94016234	WHC-SD-EN-RA-005
DE94014411	PNL-SA-23722	DE94015321	EGG-WROC-11148	DE94016278	EGG-WM-8773
DE94014435	LA-UR-94-1946	DE94015329	WHC-SD-EN-TI-266	DE94016292	LA-UR-94-2418
DE94014445	PNL-SA-24336	DE94015330	DOE/RL-93-37	DE94016319	ORNL/RASA-94/2
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DE94014483	WHC-SD-WM-RPT-060	DE94015332	WHC-MR-0463	DE94016361	UCRL-JC-115613
DE94014494	PNL-SA-24157	DE94015335	WHC-SD-EN-TI-265	DE94016373	ANL/DIS/CP-83606
DE94014496	PNL-SA-23790	DE94015337	WHC-SD-EN-DP-089	DE94016415	ANL-93/38
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DE94014571	PNL-SA-23488	DE94015383	EGG-WM-11053	DE94016433	SD-WM-TP-30
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DE94016455	UCRL-JC-116572	DE94017478	PNL-SA-24739	DE94018354	ANL/EA/CP-83690
DE94016458	WHC-EP-0780	DE94017479	PNL-SA-24403	DE94018378	ANL/ER/CP-83877
DE94016459	WHC-EP-0743	DE94017480	PNL-SA-24418	DE94018393	ANL/ITD/CP-83704
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DE94016463	WHC-EP-0474-13	DE94017503	DOE/EM-0181	DE94018398	DOE/EM-0191P
DE94016466	WHC-SD-WM-RA-010	DE94017531	ORNL/TM-12765	DE94018399	SAND-94-8005
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DE94016469	WHC-SA-1968	DE94017588	DOE/MC/29116-3858	DE94018405	ORNL/ER/Sub-87-99053/72
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DE94017161	DOE/OR-01-1276-D1	DE94018062	ANL-94/17	DE94018482	DOE/AL/62350-128
DE94017164	DOE/OR/22160-T12	DE94018075	LA-UR-94-2691	DE94018483	DOE/AL/62350-19F-Rev.3
DE94017174	UCRL-JC-117678	DE94018076	LA-UR-94-2694	DE94018484	DOE/AL/62350-104
DE94017183	K/EM-67	DE94018089	LA-UR-94-2544	DE94018485	DOE/AL/62350-139-Rev.2
DE94017287	DOE/ID/12584-179	DE94018109	WHC-SD-W113-ACDR-001	DE94018486	DOE/AL/62350-146
DE94017291	SAND-94-0482	DE94018110	WHC-SD-EN-TI-220	DE94018487	DOE/AL/62350-T1
DE94017295	UCRL-ID-115645	DE94018132	CONF-940225-124	DE94018489	WHC-SA-2337
DE94017314	DOE/EM-0109P-Rev.1	DE94018133	CONF-941124-8	DE94018501	WHC-SD-WM-CSDD-008-Rev.1
DE94017316	ORNL/TM-12760	DE94018150	WHC-SA-2235	DE94018502	WHC-SD-W058-FDC-001-Rev.2
DE94017322	DOE/RL-93-77	DE94018151	WHC-SD-WM-TI-607	DE94018504	WHC-SD-WM-DA-162
DE94017323	WHC-SD-EN-RPT-025	DE94018152	WHC-SD-WM-ER-343	DE94018506	WHC-SD-SNF-PHA-001
DE94017324	DOE/RL-91-19	DE94018153	WHC-SA-2568	DE94018507	WHC-SD-WM-ATRA-089
DE94017325	WHC-SD-EN-TI-277	DE94018154	WHC-SA-2569	DE94018508	WHC-SD-WM-TP-265
DE94017333	DOE/RL-94-43	DE94018155	WHC-SA-2587	DE94018509	WHC-SD-W296-SAD-001
DE94017392	PNL-9787	DE94018156	WHC-SD-WM-ANAL-014	DE94018511	WINCO-1222
DE94017396	PNL-10050	DE94018157	WHC-SA-2562	DE94018517	SAND-94-1958
DE94017414	UCRL-JC-115886	DE94018159	WHC-SP-1094-FY94	DE94018526	DOE/MC/29467-3779
DE94017416	WHC-SA-1455	DE94018160	WHC-SA-2594	DE94018528	DOE/MC/29467-3785
DE94017422	ORNL/TM-11250	DE94018161	WHC-SD-W236B-FRD-001	DE94018529	DOE/AL/62350-24F-Attach.2
DE94017455	PNL-SA-24564	DE94018162	WHC-SP-1098	DE94018530	DOE/AL/62350-24F-Attach.3-4
DE94017456	PNL-SA-24404	DE94018163	DOE/RL-94-05	DE94018531	DOE/AL-62350-24F-Attach.3-App.A
DE94017457	PNL-SA-24565	DE94018164	WHC-SA-2434		
DE94017459	PNL-SA-23882	DE94018165	DOE/RL-94-52		
DE94017460	PNL-SA-23850	DE94018167	DOE/RL-94-81		
DE94017461	PNL-SA-23806	DE94018286	LA-UR-94-2830		
DE94017464	PNL-SA-24297	DE94018290	LA-UR-94-2808		
DE94017466	PNL-9978	DE94018296	LA-UR-94-2880		

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DE94018532	DOE/AL/62350-24F- Attach.3-App.B	DE94019131	PNL-9822	DE95000352	WHC-SD-WM-TRP-105- Rev.6
DE94018613	LA-UR-94-1544	DE94019134	EGG-11265-1069	DE95000353	WHC-SD-WM-TP-164
DE94018616	DOE/EM-0192T	DE94019135	DOE/RL/11946-T2-Vol.1	DE95000424	ORNL/TM-12781
DE94018618	PNL-10062	DE94019136	DOE/RL/11946-T2-Vol.2	DE95000426	PNL-10074
DE94018619	PNL-10075	DE94019144	CONF-940433-7	DE95000428	WHC-SD-PRP-HA-005
DE94018620	PNL-10078	DE94019150	CONF-9408112-1	DE95000429	WHC-EP-0125-6
DE94018661	CONF-930445-29	DE94019164	LA-SUB-94-18	DE95000430	WHC-SD-EN-TI-281
DE94018667	CONF-930873-34	DE94019171	LA-SUB-94-116	DE95000431	WHC-SD-LL-ES-040
DE94018680	WHC-SD-TP-SEP-024	DE94019181	SAND-94-0996C	DE95000432	WHC-SD-WM-TP-267
DE94018681	WHC-SD-WM-TI-623	DE94019186	PNL-SA-24298	DE95000433	WHC-SD-EN-AP-179
DE94018683	DOE/RL-90-38-Rev.1	DE94019189	PNL-SA-24285	DE95000434	WHC-SD-GN-TRP-30010
DE94018684	WHC-SA-2624	DE94019190	PNL-SA-23386	DE95000435	WHC-SD-SNF-WP-007
DE94018685	DOE/RL-94-96	DE94019191	PNL-SA-23453	DE95000436	WHC-EP-0803
DE94018686	DOE/RL-93-73	DE94019192	PNL-SA-24790	DE95000437	WHC-SD-ER-CSWD-004
DE94018688	DOE-0252	DE94019209	ORNL/ER-167	DE95000438	WHC-SD-WM-SARR-028
DE94018689	WHC-SA-2583	DE94019210	ORNL/ER/Sub-87-99053/54	DE95000439	WHC-SD-TP-PDC-001- Rev.1
DE94018702	CONF-931113-1	DE94019211	DOE/OR-01-1167-D2	DE95000442	ORNL/ER-120
DE94018707	CONF-9302191-1	DE94019213	ORNL/ER/Sub-87-99053/71	DE95000447	WHC-SD-EN-RD-010
DE94018710	CONF-940550-14	DE94019214	ES/ER/TM-56/V1	DE95000451	WHC-SD-WM-TRP-109- Rev.4
DE94018719	PNL-SA-23597	DE94019215	ES/ER/TM-56/V2	DE95000452	WHC-SD-WM-TRP-108- Rev.4
DE94018720	PNL-SA-24849	DE94019241	DOE/OR-01-1282-D1	DE95000453	WHC-SD-WM-TRP-107- Rev.5
DE94018724	PNL-SA-23865	DE94019249	ORNL/ER/Sub-87-99053/73	DE95000454	WHC-SD-WM-TRP-106- Rev.5
DE94018726	PNL-6415-Rev.6	DE94019259	ANL/CMT/CP-82692	DE95000456	WHC-SD-C018H-TP-010- Rev.1
DE94018727	WHC-SD-WM-ANAL-033- Vol.1	DE94019323	CONF-940853-10	DE95000457	WHC-SD-WM-TP-017
DE94018728	WHC-SD-WM-ANAL-033- Vol.2	DE94019341	WHC-SD-EN-RA-009	DE95000458	WHC-SA-1950
DE94018732	WSRC-RP-94-00062	DE94019342	WHC-EP-0573-2	DE95000459	WHC-EP-0796
DE94018733	PNL-9814-Rev.1	DE95000004	DOE/MC/29110-3879	DE95000460	WHC-SA-2551
DE94018737	SAND-94-0203C	DE95000006	DOE/MC/29119-3881	DE95000461	WHC-SD-WM-TI-591
DE94018741	SAND-94-2072C	DE95000030	DOE/MC/30176-3937	DE95000462	WHC-SD-WM-RPT-096
DE94018888	SAND-94-0495C	DE95000033	DOE/MC/29467-3939	DE95000463	WHC-SD-WM-TC-062
DE94018908	SAND-94-2248C	DE95000040	DOE/METC-95/1014	DE95000464	WHC-SD-WM-TP-243
DE94018912	PNL-SA-24752	DE95000043	DOE/MC/29467-3952	DE95000466	WHC-SD-WM-ER-367
DE94018915	PNL-SA-24382	DE95000047	DOE/MC/29116-3956	DE95000486	CONF-940433-8
DE94018917	PNL-SA-24448	DE95000054	DOE/MC/29105-3970	DE95000487	CONF-940809-6
DE94018918	PNL-SA-24320	DE95000063	DOE/MC/29467-3986	DE95000499	WSRC-TR-94-0286-ESS
DE94018923	PNL-SA-24676	DE95000066	DOE/MC/30359-3990	DE95000501	WHC-SD-CP-TP-076
DE94018931	DOE/EM-0194	DE95000074	DOE/MC/30164-4000	DE95000502	WHC-SD-WM-WP-283
DE94018962	CONF-930408-84	DE95000306	WHC-SD-WM-TRP-114- Rev.6	DE95000503	WHC-SD-WM-OTP-151
DE94018971	CONF-9310358-1	DE95000308	WHC-SD-WM-ER-377	DE95000504	WHC-SD-WM-CM-008
DE94018972	CONF-9310355-1	DE95000309	WHC-SD-WM-TRP-209	DE95000505	WHC-SD-WM-EV-073
DE94019003	WHC-SD-WM-ANAL-035- Vol.1	DE95000310	WHC-SD-WM-TI-651	DE95000506	WHC-SD-TP-PDC-022
DE94019004	WHC-SD-WM-ANAL-035- Vol.2	DE95000311	WHC-SD-WM-TRP-113- Rev.5	DE95000512	UCRL-ID-116220
DE94019005	WHC-SD-WM-CM-011	DE95000317	PNL-9874	DE95000514	WHC-SD-CP-TP-077
DE94019006	WHC-SD-WM-ATP-096	DE95000319	PNL-9824	DE95000515	WHC-SD-WM-DP-069
DE94019009	WHC-SD-WM-TI-646	DE95000320	PNL-9823	DE95000516	WHC-SD-WM-PLN-076
DE94019010	WHC-SD-EN-TI-285	DE95000332	EGG-MS-11400	DE95000517	WHC-SA-2584
DE94019011	WHC-SD-CP-ES-160	DE95000333	EGG-MS-11303	DE95000522	WHC-SD-WM-ES-299
DE94019012	WHC-SD-WM-ES-185	DE95000336	WHC-SA-2640	DE95000523	WHC-SD-WM-TP-227
DE94019038	WHC-EP-0182-74	DE95000337	WHC-SD-WM-TRP-106- Rev.6	DE95000525	WHC-SA-2305
DE94019039	WHC-EP-0791	DE95000338	WHC-SD-W059-FRD-001- Rev.1	DE95000526	WHC-SD-WM-ER-361
DE94019040	WHC-SD-EN-TP-048	DE95000339	WHC-SD-WM-TRP-109- Rev.5	DE95000530	WHC-SD-WM-ER-358
DE94019041	DOE/RL-94-74	DE95000340	WHC-SD-WM-TRP-107- Rev.6	DE95000532	WSRC-MS-94-0499
DE94019042	DOE/RL-94-82	DE95000341	WHC-SD-WM-PCP-009	DE95000533	WHC-SD-WM-TRP-105- Rev.5
DE94019043	WHC-EP-0787	DE95000342	WHC-SD-ER3641-ATP-003- Rev.1	DE95000534	WHC-SD-WM-ER-359
DE94019054	WHC-SD-SP-SSP-001	DE95000343	WHC-SD-WM-ATP-104	DE95000535	SAND-94-2275C
DE94019055	WHC-SD-WM-MAR-001	DE95000344	WHC-SD-WM-OTP-158	DE95000546	SAND-94-2272C
DE94019056	WHC-EP-0394-8	DE95000345	WHC-SD-ER3641-ATP-002- Rev.2	DE95000567	DOE/MC/30168-94/C0348
DE94019057	WHC-EP-0431-Rev.1	DE95000347	WHC-SD-WM-ATR-084	DE95000583	ANL/EAD/TM-19
DE94019058	WHC-EP-0785	DE95000348	WHC-SD-WM-TI-616	DE95000587	WINCO-1217
DE94019059	DOE/RL-94-77	DE95000349	WHC-SD-WM-ATR-078	DE95000599	DOE/AL/58309-56
DE94019063	WSRC-MS-94-0211	DE95000351	WHC-SD-W402-CR-001- Rev.1	DE95000616	DOE/OR-01-1173-D2
DE94019084	PNL-9746			DE95000632	DOE/OR-01-1252-D2
DE94019088	WINCO-1221			DE95000674	WHC-SD-WM-TI-650
DE94019089	WINCO-1223				
DE94019104	PNL-SA-24319				
DE94019116	CONF-930769-5				

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DE95000675	WHC-SD-WM-TI-653	DE95001037	WHC-SD-W320-TIS-001	DE95001307	WHC-SD-SNF-CSER-001
DE95000678	WHC-SD-WM-ATP-105	DE95001038	WHC-SD-WM-ETP-119	DE95001308	WHC-SD-W364-PMP-001
DE95000679	WHC-SD-SQA-TA-20011- Rev.1	DE95001039	WHC-SD-WM-TP-263	DE95001309	WHC-SD-WM-CR-057
DE95000680	WHC-SD-WM-ATP-098	DE95001040	WHC-SD-L070-PMP-001	DE95001310	WHC-SD-W320-PMP-001- Rev.2
DE95000716	WHC-SD-WM-ETP-113	DE95001041	WHC-SD-GN-TRP-30011	DE95001311	PNL-10100
DE95000717	WHC-SD-WM-OTP-159	DE95001042	WHC-SD-PRP-HA-008	DE95001313	WHC-SA-2657
DE95000732	WHC-MR-0465	DE95001043	WHC-SD-PRP-HA-012	DE95001314	WHC-EP-0527-3
DE95000733	WHC-EP-0730	DE95001044	WHC-SD-WM-DA-161	DE95001316	WHC-SP-1109
DE95000734	WHC-EP-0800	DE95001045	WHC-SD-WM-ATP-102	DE95001325	DOE/MC/29467-3877
DE95000735	WHC-EP-0758	DE95001065	ANL/CMT/CP-82400	DE95001349	CONF-9411138-1
DE95000736	WHC-SD-WM-TPP-052	DE95001080	ANL-94/10	DE95001371	WHC-SD-WM-ES-318
DE95000759	WSRC-TR-94-0287	DE95001100	ANL/CMT/CP-84043	DE95001372	WHC-SD-WM-TRP-215
DE95000761	BNL-60842	DE95001103	DOE/EM-0196	DE95001373	WHC-SD-WM-ATP-082
DE95000769	PNL-10091	DE95001111	SAND-94-0981	DE95001374	WHC-SD-WM-EV-060-Rev.4
DE95000770	PNL-10105	DE95001113	SAND-93-2450	DE95001375	WHC-SD-WM-DTR-036
DE95000771	PNL-10112	DE95001135	DOE/MC/29116-3913	DE95001376	WHC-SD-WM-AP-381
DE95000773	PNL-10120	DE95001157	PNL-10153	DE95001377	WHC-SD-WM-TI-664
DE95000775	WINCO-1214	DE95001158	PNL-10095	DE95001378	WHC-SD-WM-RPT-093
DE95000776	WINCO-1226	DE95001159	PNL-10064	DE95001380	DOE/OR-01-1276-D2
DE95000777	WINCO-1228	DE95001160	PNL-10137-Rev.1	DE95001381	DOE/OR-01-1291-D1
DE95000778	WINCO-1229	DE95001163	WHC-SD-WM-TRP-202	DE95001384	ES/ER/TM-120/V1
DE95000796	WHC-EP-0793	DE95001164	WHC-SD-WM-ER-368	DE95001385	ES/ER/TM-120/V2
DE95000797	WHC-SA-2403	DE95001227	WHC-SD-WM-ER-362	DE95001386	ES/ER/TM-120/V3
DE95000798	WHC-SD-EN-AP-177	DE95001228	WHC-SD-WM-TRP-114- Rev.5	DE95001390	EGG-WTD-11185
DE95000799	WHC-SD-WM-OMM-011	DE95001230	WHC-SD-WM-DQO-007	DE95001402	WHC-SP-1104
DE95000801	WHC-SD-W236B-SOW-001	DE95001231	WHC-SD-WM-DA-135	DE95001403	WHC-SD-WM-ER-365
DE95000809	DOE/AL/58309-57	DE95001232	WHC-SD-WM-ES-290-Rev.2	DE95001404	WHC-SD-WM-TI-399-Rev.2
DE95000825	PNL-10098	DE95001233	WHC-SD-WM-TRP-111- Rev.5	DE95001405	WHC-SD-WM-ER-369
DE95000831	PNL-10164	DE95001234	WHC-SD-WM-TRP-201	DE95001406	WHC-SD-WM-AP-381
DE95000832	WINCO-1224	DE95001235	WHC-SD-WM-TRP-113- Rev.4	DE95001407	WHC-SD-WM-ER-364
DE95000839	PNL-8955	DE95001236	WHC-SD-WM-TRP-112- Rev.5	DE95001408	WHC-SD-WM-TI-643
DE95000872	LA-UR-94-3077			DE95001409	WHC-SD-WM-TI-652
DE95000898	PNL-10130			DE95001410	WHC-SD-WM-TPI-016- Rev.2
DE95000911	LA-UR-94-3196	DE95001237	WHC-SD-WM-TI-654	DE95001411	WHC-SD-WM-PMP-014
DE95000912	LA-UR-94-3195	DE95001249	WHC-SP-1096	DE95001413	SAND-93-2441
DE95000937	LA-UR-94-3233	DE95001258	DOE/AL/62350-156	DE95001431	PNL-SA-23687
DE95000941	LA-UR-94-3252	DE95001259	DOE/AL/62350-120-Rev.1	DE95001434	WHC-SD-WM-DQO-014
DE95000975	PNL-10109	DE95001260	DOE/AL/62350-T2	DE95001435	WHC-SD-WM-PRS-014
DE95000976	PNL-10079	DE95001261	DOE/AL/62350-104-Rev.1	DE95001436	WHC-SD-W236A-ER-011
DE95000978	PNL-10094	DE95001262	DOE/AL/62350-T3	DE95001441	ANL/CMT/CP-82509
DE95000983	WHC-SD-WM-DA-169	DE95001263	DOE/AL/62350-65	DE95001462	PNL-9424
DE95000984	WHC-SD-WM-ES-303	DE95001264	DOE/AL/62350-140	DE95001463	WHC-SD-EN-TRP-007
DE95000985	WHC-SD-L045H-ER-003	DE95001265	DOE/AL/62350-26	DE95001465	WSRC-TR-94-0296
DE95000987	WHC-SD-W340-SEL-002	DE95001266	DOE/AL/62350-142	DE95001468	WHC-SD-WM-ER-363
DE95000988	WHC-SD-EN-TI-204	DE95001267	DOE/AL/62350-155	DE95001473	WSRC-TR-94-0425
DE95000989	WHC-SD-HWV-UM-004- Rev.1	DE95001268	DOE/AL/62350-60F-Rev.1	DE95001476	WSRC-TR-93-762
DE95000991	WHC-SD-CP-MAR-001	DE95001269	DOE/AL/62350-158	DE95001479	DOE/MC/29113-3912
DE95000993	WHC-SD-WM-DP-088	DE95001270	DOE/AL/62350-152	DE95001484	PNL-10147
DE95000994	WHC-SD-SNF-TI-004	DE95001271	DOE/AL/62350-162	DE95001511	WHC-SD-WM-ES-300
DE95000995	WHC-SD-610-ATP-002	DE95001272	DOE/AL/62350-72D-Rev.1	DE95001512	WHC-SD-WM-ES-311
DE95000997	WHC-SA-2563	DE95001273	DOE/AL/62350-145	DE95001513	WHC-SD-WM-TI-594-Rev.1
DE95000999	DOE/MWIP-5	DE95001274	DOE/AL/62350-154	DE95001514	WHC-SD-WM-ATP-103
DE95001000	ORNL/TM-12768	DE95001275	DOE/AL/62350-164	DE95001515	WHC-SD-WM-WP-132- Rev.4
DE95001003	WHC-SD-PRP-HA-011	DE95001276	DOE/AL/62350-165	DE95001516	WHC-SD-W049H-ATP-001
DE95001004	WHC-SD-WM-WP-285	DE95001278	DOE/AL/62350-61-Rev.1	DE95001520	WHC-SD-W100-TP-011
DE95001020	LA-UR-94-3359	DE95001279	DOE/EA-0339-Rev.2	DE95001521	WHC-SD-WM-SSP-005
DE95001023	WHC-SP-1101-Vol.1	DE95001280	DOE/AL/62350-160	DE95001527	WHC-EP-0775
DE95001024	WHC-SP-1101-Vol.2	DE95001281	DOE/AL/62350-157	DE95001528	WHC-SP-1137
DE95001025	WHC-SP-1101-Vol.3	DE95001282	DOE/AL/62350-143	DE95001529	WHC-EP-0794
DE95001026	WHC-SP-1101-Vol.4	DE95001283	DOE/AL/62350-98	DE95001530	WHC-SD-WM-TI-404-Rev.3
DE95001027	WHC-SP-1101-Vol.5	DE95001290	DOE/NV-381	DE95001531	WHC-SD-SNF-TP-007
DE95001029	WHC-SD-WM-TS-005	DE95001294	ICF-0001	DE95001532	WHC-SD-W378-ES-001
DE95001030	WHC-SD-WM-TI-659	DE95001296	WHC-EP-0460	DE95001533	WHC-SD-W-113-OCD-001
DE95001031	WHC-EP-0468-3	DE95001298	WHC-SP-1115	DE95001534	WHC-SA-2683
DE95001032	WHC-SD-SQA-CSA-20368	DE95001300	WHC-SD-WM-CSD-004	DE95001536	WHC-SD-SNF-ER-099
DE95001033	WHC-SD-SNF-ES-002	DE95001301	WHC-SD-WM-ER-360	DE95001537	WHC-SD-WM-TI-656
DE95001034	WHC-SD-WM-TI-658	DE95001304	WHC-SD-SQA-CSA-20373	DE95001538	WHC-SD-GN-TRP-30018
DE95001035	WHC-SD-SNF-ES-001	DE95001305	WHC-SD-WM-TP-247	DE95001539	WHC-SD-ETF-PLN-002
DE95001036	WHC-SD-C018-RPT-003	DE95001306	WHC-SD-CP-PLN-025		

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DE95001540	WHC-SD-W221-ES-002	DE95001709	WHC-SD-WM-TP-257	DE95002029	EGG-MS-11297
DE95001541	WHC-SD-FF-PSE-002	DE95001710	DOE/EM-0193	DE95002030	EGG-M-94273
DE95001542	WHC-SD-WM-DP-089	DE95001749	LA-SUB-94-139	DE95002031	EGG-WTD-11252
DE95001543	WHC-SD-WM-ATR-081	DE95001769	Y/ER-158	DE95002034	EGG-WTD-11216
DE95001544	WHC-SD-WM-AP-019-Rev.1	DE95001772	DOE/OR-01-1311-D1	DE95002035	EGG-NRE-11451
DE95001545	WHC-SD-WM-ES-320	DE95001790	PNL-10138	DE95002036	EGG-WTD-11403
DE95001546	WHC-SD-TP-RPT-014	DE95001793	SAND-94-1235	DE95002039	EGG-WM-10774-Rev.2
DE95001554	WHC-EP-0694	DE95001794	SAND-94-1237	DE95002041	EGG-MS-11420
DE95001556	WHC-SD-WM-SDD-049	DE95001821	WHC-SP-1126-Vol.1	DE95002044	DOE/LLW-212
DE95001557	WHC-SD-SNF-ER-003	DE95001822	WHC-SP-1126-Vol.2	DE95002045	DOE/LLW-157-Rev.1
DE95001558	WHC-SD-SNF-TP-008	DE95001823	WHC-SP-1126-Vol.3	DE95002046	EGG-M-94219
DE95001559	WHC-SD-L045H-PC-001	DE95001824	WHC-SP-1126-Vol.4	DE95002047	EGG-WTD-11137
DE95001560	WHC-SD-WM-ATP-023-Rev.5	DE95001836	WHC-SD-WM-SAR-064	DE95002048	EGG-WTD-10640
DE95001561	WHC-SD-WM-FRD-019	DE95001838	WHC-SD-W026-TI-006-Rev.1	DE95002050	EGG-WM-11250
DE95001562	WHC-SD-ER-TC-001	DE95001839	WHC-SD-W100-SDRD-001	DE95002052	EGG-EES-11478
DE95001564	WHC-SD-TD-ER-004	DE95001840	WHC-SD-NR-CSE-013	DE95002055	DOE/OR-01-1161/V1-D2/A1
DE95001565	WHC-SD-FF-SSP-052	DE95001842	WHC-SD-W026-TP-008	DE95002059	ORNL/TM-12785
DE95001566	WHC-SD-GN-DGS-30011	DE95001843	WHC-EP-0805	DE95002066	DOE/OR-01-1273/V1-D1
DE95001567	WHC-SD-WM-ES-288	DE95001844	WHC-SP-1097	DE95002067	DOE/OR-01-1273/V2-D1
DE95001568	WHC-SD-GN-ISB-30001	DE95001846	WHC-EP-0782-Vol.1	DE95002068	DOE/OR-01-1161/V1-D2
DE95001569	WHC-SD-WM-MAR-003	DE95001847	WHC-EP-0782-Vol.2	DE95002070	WHC-SD-L045H-PLN-004
DE95001570	WHC-SD-WM-DQO-011-Rev.1	DE95001852	DOE/RL-94-113	DE95002071	WHC-SD-W026-TI-009
DE95001573	WHC-SD-EN-TI-247	DE95001854	PNL-10133	DE95002072	WHC-SD-HWV-WP-005
DE95001574	WHC-SD-WM-TRP-218	DE95001855	PNL-10182	DE95002074	WHC-SD-WM-WP-264
DE95001575	DOE/ID/13042-39	DE95001869	ORNL/ER-152	DE95002075	WHC-SD-WM-ATR-098
DE95001576	WHC-SP-1124	DE95001898	WHC-SD-WM-ER-308	DE95002076	WHC-SD-WM-ETP-122
DE95001577	WHC-SP-1116	DE95001899	WHC-SD-WM-ER-324	DE95002077	WHC-SD-WM-SD-019
DE95001578	WHC-EP-0816	DE95001900	WHC-SD-WM-ER-311	DE95002078	WHC-SD-WM-TA-158
DE95001579	WHC-EP-0801-Draft	DE95001901	WHC-SD-WM-ER-312	DE95002079	WHC-SD-TP-SEP-026
DE95001581	WHC-SD-PRP-HA-013	DE95001902	EGG-M-94237	DE95002080	WHC-SD-WM-TP-207
DE95001582	WHC-SD-PRP-HA-007	DE95001904	EGG-WTD-11156	DE95002081	WHC-SD-CP-PLN-026
DE95001589	DOE/MC/29115-95/C0403	DE95001905	EGG-WM-11342	DE95002082	WHC-SD-CP-QAPP-015
DE95001590	DOE/MC/30362-95/C0405	DE95001906	DOE/ID-10390(94)-Rev.1	DE95002083	WHC-SD-W025-VI-001
DE95001592	WHC-SD-WM-CSDD-014	DE95001911	DOE/LLW-103-Rev.1	DE95002084	WHC-SD-WM-TI-661
DE95001593	WHC-SD-W026-OCD-001	DE95001913	DOE/ID-22115	DE95002085	WHC-SD-W007H-ATP-001
DE95001594	WHC-SD-PRP-HA-016	DE95001916	EGG-WTD-11136	DE95002086	WHC-SD-W007H-ATP-002
DE95001595	WHC-SD-WM-ES-314	DE95001921	EGG-WM-11479	DE95002087	WHC-SD-WM-SDD-027
DE95001596	WHC-SD-PRP-HA-010	DE95001922	PNL-10158	DE95002089	WHC-SD-W320-TC-002
DE95001597	WHC-SD-SNF-TC-001	DE95001923	PNL-10150	DE95002090	WHC-SD-WM-TI-645
DE95001598	WHC-SD-SNF-SARR-001	DE95001926	EGG-WTD-10651	DE95002091	WHC-SD-WM-ER-387
DE95001599	WHC-SD-SQA-CSWD-30016	DE95001927	DOE/LLW-139	DE95002092	WHC-SD-WM-ER-379
DE95001600	WHC-SD-W112-ES-006	DE95001951	EGG-WM-11454	DE95002093	WHC-SD-WM-DGS-001
DE95001605	SAND-94-0805C	DE95001977	EGG-WTD-11138	DE95002094	WHC-SD-WM-TP-271
DE95001617	SAND-94-2354C	DE95001978	DOE/LLW-188	DE95002095	WHC-SD-WM-ER-382
DE95001618	SAND-94-2380C	DE95001979	WHC-SD-WM-ER-323	DE95002097	WHC-SD-WM-WP-072-Rev.3
DE95001631	WHC-SD-WM-PE-053	DE95001980	WHC-SD-WM-ER-309	DE95002098	WHC-SD-WM-EV-098
DE95001632	WHC-SD-WM-ER-372	DE95001981	WHC-SD-W026-TP-001	DE95002106	WHC-EP-0809
DE95001633	WHC-SD-WM-ER-370	DE95001982	WHC-SD-WM-ER-313	DE95002107	WHC-SP-1119
DE95001634	WHC-SD-WM-DA-170	DE95001983	WHC-SD-WM-ER-310	DE95002108	WHC-SD-SNF-PLN-001
DE95001636	WHC-SD-WM-SDD-025	DE95001984	WHC-SD-WM-RD-038-Rev.1	DE95002109	WHC-SD-W100-TP-014
DE95001637	WHC-SD-SQA-CSA-20377	DE95001985	WHC-SP-1009-Rev.1	DE95002110	WHC-SD-NR-ER-105
DE95001638	WHC-SD-WM-TI-648	DE95001986	WHC-MR-0418	DE95002111	WHC-SD-WM-TP-163
DE95001639	DOE/RL-94-97	DE95001987	WHC-SA-2141	DE95002113	WHC-SD-W100-AP-002
DE95001640	WHC-SA-2664	DE95001988	WHC-EP-0804	DE95002115	WHC-SD-WM-DP-071
DE95001641	WHC-SA-1884	DE95002004	EGG-RAAM-11376	DE95002116	WHC-SD-WM-ATP-108
DE95001642	WHC-SA-1937	DE95002005	EGG-NRE-11452	DE95002118	WHC-SD-WM-TP-219-Rev.1
DE95001643	WHC-SA-2302	DE95002006	EGG-GEO-10797-Rev.2	DE95002119	WHC-SD-TP-SEP-028
DE95001644	WHC-SD-SQA-CSA-20374	DE95002007	DOE/ID-10054(93)	DE95002120	WHC-SD-GN-SA-30006
DE95001645	WHC-SD-WM-PLN-092	DE95002008	EGG-WTD-11424	DE95002141	WHC-SD-GN-CSWD-30036-Rev.1
DE95001649	WHC-SD-SNF-LB-001	DE95002010	EGG-M-94222	DE95002142	WHC-SD-WM-ATP-100
DE95001650	DOE/ID/13042-38	DE95002011	EGG-WTD-11252-Vol.1	DE95002143	WHC-SD-WM-WP-245-Rev.1
DE95001658	PNL-10128	DE95002013	DOE/LLW-206	DE95002144	WHC-SD-W236A-ER-008
DE95001659	PNL-10101	DE95002014	DOE/LLW-207	DE95002145	WHC-SD-WM-QAPP-029
DE95001660	PNL-10099	DE95002018	EGG-WM-11049	DE95002146	WHC-SD-WM-CSRS-016
DE95001661	PNL-10127	DE95002019	EGG-WM-11467	DE95002147	WHC-SD-SNF-TP-004
DE95001697	DOE/OR-01-1268/V1-D1	DE95002022	EGG-WM-10877-Rev.1	DE95002148	WHC-SD-SNF-TP-003
DE95001698	DOE/OR-01-1268/V2-D1	DE95002024	DOE/ID-10454	DE95002152	WHC-SD-SNF-ATR-003
DE95001701	DOE/OR/21865-1	DE95002025	DOE/ID-10057(93)	DE95002155	WHC-SD-W378-SF-001
		DE95002027	EGG-WTD-10981-Vol.1		
		DE95002028	EGG-WTD-10981-Vol.2		

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DE95002156	WHC-SD-EN-TI-290	DE95002475	WHC-SA-2627	DE95003066	WHC-SD-W100-TC-001
DE95002157	WHC-SD-WM-WP-174-Rev.1	DE95002476	WHC-SA-2504	DE95003067	WHC-SD-WM-ES-310
DE95002158	WHC-SD-WM-DA-159	DE95002478	WHC-SA-2669	DE95003068	WHC-SD-W320-TIS-001-Rev.1
DE95002159	WHC-SD-WM-FDC-032	DE95002479	WHC-SD-FF-CSWL-00016-Rev.1	DE95003069	WHC-SD-WM-PICD-004
DE95002160	WHC-SD-WM-FDC-031	DE95002507	ORNL/TM-12774	DE95003070	WHC-SD-WM-DRR-047
DE95002161	WHC-SD-WM-QAPP-030	DE95002509	DOE/MC/29109-3898	DE95003071	WHC-SD-WM-ATR-088
DE95002187	SAND-94-2759C	DE95002512	ORNL/TM-12792	DE95003072	WHC-SD-WM-DA-164
DE95002189	SAND-94-2703C	DE95002582	PNL-10061	DE95003073	WHC-SD-GN-TRP-20024
DE95002208	WHC-SD-WM-ER-373	DE95002583	PNL-10172	DE95003074	WHC-SD-WM-DTP-033
DE95002209	WHC-SD-WM-ES-313	DE95002585	PNL-10176	DE95003075	WHC-SD-WM-DP-068
DE95002210	WHC-SD-WM-ANAL-018	DE95002685	WSRC-TR-94-0387	DE95003076	WHC-SD-WM-ANAL-020-Rev.1
DE95002211	WHC-SD-WM-PC-002-Rev.6	DE95002696	WSRC-TR-94-0348	DE95003077	WHC-SD-SNF-ATP-005
DE95002232	WHC-EP-0786	DE95002697	WSRC-TR-94-0346	DE95003078	WHC-SD-WM-TP-281
DE95002233	WHC-SD-WM-ER-325	DE95002698	WSRC-TR-94-0347	DE95003079	WHC-SD-WM-TP-279
DE95002235	WHC-SD-WM-EV-025-Rev.1	DE95002699	LA-UR-94-3685	DE95003080	WHC-SD-WM-SEL-036
DE95002236	WHC-SD-WM-ETP-0106	DE95002717	LA-UR-94-3483	DE95003081	WHC-SD-WM-ATP-111
DE95002237	WHC-SD-WM-ATR-044	DE95002729	LA-UR-94-3637	DE95003082	WHC-SD-SNF-TP-009
DE95002239	WHC-SD-WM-RPT-087	DE95002730	LA-UR-94-3633	DE95003083	WHC-SD-WM-DB-024
DE95002240	WHC-SD-WM-ER-347	DE95002731	LA-UR-94-3632	DE95003084	WHC-SD-WM-DA-173
DE95002241	WHC-SD-WM-TP-165	DE95002831	DOE/WIPP-94-2018	DE95003085	WHC-SD-WM-FHA-005
DE95002242	WHC-SD-WM-SWD-015	DE95002832	DOE/WIPP-94-1020	DE95003087	WHC-SD-WM-ANAL-037
DE95002243	BNL-60830	DE95002833	DOE/WIPP-94-2027	DE95003096	ANL/EAD/TM-24
DE95002262	DOE/CAO-941046	DE95002837	WHC-SP-1122-Vol.1	DE95003127	DOE/METC/C-95/7163
DE95002277	EGG-NRE-10754	DE95002838	WHC-SP-1122-Vol.2	DE95003145	PNL-SA-21389
DE95002278	WHC-SD-TP-UM-002-Rev.1	DE95002839	WHC-SP-1122-Vol.3	DE95003146	PNL-SA-23598
DE95002279	WHC-SD-WM-LL-006	DE95002840	WHC-SP-1122-Vol.4	DE95003148	PNL-SA-24079
DE95002280	WHC-SD-WM-CSCM-027	DE95002841	ORNL/TM-12825	DE95003152	PNL-SA-24498
DE95002281	WHC-SD-WM-HIE-003	DE95002845	PNL-10146	DE95003153	PNL-SA-23918
DE95002282	WHC-SD-TD-RPT-012	DE95002853	PNL-10107	DE95003156	WHC-SD-WM-TI-668
DE95002288	ORNL/ER-73	DE95002854	PNL-10131	DE95003157	WHC-SD-WM-DCR-002
DE95002289	ORNL/ER-68	DE95002855	PNL-10160	DE95003158	WHC-SD-WM-ATP-069-Rev.2
DE95002290	ORNL/ER-26	DE95002856	PNL-10184	DE95003161	WHC-SD-WM-TI-633
DE95002291	ORNL/ER-69	DE95002901	ANL/CMT/PP-78044	DE95003162	WHC-SD-W314-PLN-001
DE95002292	ORNL/ER-74	DE95002904	ANL/ET/CP-83175	DE95003163	WHC-SD-WM-ATP-092
DE95002294	ORNL/ER-213/R1	DE95002912	ANL/CMT/CP-84751	DE95003164	WHC-SD-WM-OTP-164
DE95002295	ES/ER/TM-104	DE95002950	DOE/RL-94-36-2	DE95003165	WHC-SD-WM-ER-333
DE95002297	DOE/OR-01-1314-D1	DE95002951	DOE/RL-94-127	DE95003166	WHC-SD-WM-ATP-110
DE95002298	DOE/OR-01-1312-D1	DE95002961	WHC-SD-FF-SSP-050-Rev.1	DE95003167	WHC-SD-W236A-ES-005
DE95002301	DOE/OR-01-1288-D2	DE95002962	WHC-SD-SNF-ER-004	DE95003168	WHC-SD-WM-ER-375
DE95002302	DOE/OR-01-1313-D1	DE95002966	WHC-SP-2539	DE95003169	WHC-SD-SQA-CSA-20380
DE95002304	ES/ER/TM-131	DE95002968	WHC-SP-1142	DE95003173	DOE/EM-0207
DE95002305	ORNL/ER-201	DE95002971	WHC-EP-0823	DE95003174	PNL-10123
DE95002307	ORNL/ER-72	DE95002987	ANL/CMT/CP-82152	DE95003175	PNL-10189
DE95002308	ORNL/ER-235	DE95003006	PNL-8900	DE95003176	PNL-10198
DE95002318	PNL-10082	DE95003025	DOE/MWIP-30	DE95003213	WHC-SP-0665-14
DE95002320	PNL-10168	DE95003027	FEMP-2354	DE95003215	WHC-EP-0806
DE95002322	PNL-10173	DE95003028	FEMP-2387	DE95003216	WHC-EP-0830-Vol.1
DE95002324	DOE/EM-0200	DE95003040	WHC-SD-GN-TA-30004	DE95003217	WHC-EP-0830-Vol.2
DE95002360	WHC-SD-W221-DP-001	DE95003042	DOE/RL-92-54-Rev.1	DE95003218	WHC-SD-GN-SDD-30007-Rev.1
DE95002361	WHC-EP-0446-2	DE95003043	DOE/RL-92-53-Rev.1	DE95003220	WHC-SD-W280-ATP-001
DE95002363	WHC-SD-TD-RPT-011	DE95003044	WHC-SA-2447	DE95003221	WHC-SD-NR-CSER-011-Rev.1
DE95002364	WHC-SD-L045H-OTR-001	DE95003045	WHC-SA-2448	DE95003223	WHC-SD-WM-TP-274
DE95002365	WHC-SD-TD-RPT-010	DE95003046	WHC-SA-2449	DE95003224	WHC-SD-SNF-FDR-001
DE95002366	WHC-SD-SNF-PD-001	DE95003047	WHC-SP-1110	DE95003225	WHC-SD-SNF-PD-007
DE95002367	WHC-SD-WM-TRP-220	DE95003048	ORNL/ER-71	DE95003226	WHC-SD-WM-WP-289
DE95002368	WHC-SD-WM-PAP-60	DE95003049	WHC-SD-SNF-FRD-005	DE95003228	WHC-SD-WM-TR-024-Rev.1
DE95002369	WHC-SD-WM-PLN-090	DE95003050	WHC-SD-SNF-PCP-001	DE95003229	WHC-SD-WM-TP-276
DE95002370	WHC-SD-WM-ER-380	DE95003051	WHC-SD-W087-FDC-001-Rev.3	DE95003232	WHC-SD-W405-PD-002
DE95002401	UCRL-JC-116436	DE95003052	WHC-SD-WM-DA-157	DE95003234	WHC-SD-W236A-ES-003
DE95002441	ORNL/TM-12786	DE95003054	WHC-SD-SNF-WP-001	DE95003236	WHC-SD-WM-ATR-103
DE95002442	ORNL/TM-12772	DE95003056	WHC-SD-WM-ER-029-Rev.20	DE95003239	WHC-SD-L045H-TI-005
DE95002454	LA-12865	DE95003058	WHC-SD-WM-WP-286	DE95003240	WHC-SD-NR-CSER-015
DE95002459	WHC-SD-WM-WP-287	DE95003061	WHC-SD-SNF-ES-005	DE95003241	WHC-SD-W320-ANAL-002
DE95002461	WHC-SP-0903-Rev.1	DE95003062	WHC-SD-WM-TP-259	DE95003243	WHC-SD-L045H-SM-001
DE95002462	DOE/MC/28245-3909	DE95003063	WHC-SD-WM-ATP-023-Rev.6	DE95003244	WHC-SD-WM-ES-312
DE95002467	WHC-SA-2618	DE95003064	WHC-SD-FF-OMM-010	DE95003245	WHC-SD-CP-SA-023-Rev.1
DE95002469	WHC-EP-0797	DE95003065	WHC-SD-L045H-CSDD-001		
DE95002471	UCRL-JC-118432				
DE95002473	WHC-EP-0802				
DE95002474	WHC-EP-0467-Rev.1				

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DE95003246	WHC-SD-WM-TP-273	DE95003782	WHC-SD-W100-RD-001-Rev.1	DE95003953	BNL-60977
DE95003248	WHC-SD-WM-TA-157	DE95003790	DOE/EM-0217	DE95003968	ORNL/ER-283
DE95003249	WHC-SD-WM-TP-275	DE95003792	DOE/EM-0218	DE95003970	ORNL/ER-282
DE95003250	WHC-SD-W405-PD-001	DE95003799	PNL-10053	DE95003971	ORNL/ER-269
DE95003251	WHC-SD-WM-PLN-072-Rev.1	DE95003800	PNL-10126	DE95003972	ORNL/ER-275
DE95003252	WHC-SD-WM-OTR-153	DE95003803	PNL-10208	DE95003988	ORNL/ER-226
DE95003253	WHC-SD-SNF-FDC-001	DE95003827	DOE/ID/13220-T2	DE95003991	DOE-0227-2-Rev.1
DE95003257	ORNL/ER-22	DE95003838	WHC-SD-W252-FDC-001-Rev.1	DE95003992	WHC-SD-WM-WP-289-Rev.1
DE95003260	ORNL/ER-237	DE95003839	WHC-SD-CP-TEEM-069	DE95003994	WHC-EP-0822
DE95003261	DOE/OR-01-1158	DE95003840	WHC-SD-WM-AP-030-Rev.1	DE95003995	WHC-SD-ETF-WAC-001
DE95003262	ORNL/ER-57	DE95003841	WHC-SD-WM-PROC-009-Rev.1	DE95003996	WHC-SD-WM-OTP-163
DE95003263	ORNL/ER-70	DE95003842	WHC-SD-WM-TP-280	DE95003997	WHC-SD-WM-OTP-165
DE95003264	WHC-SP-1114	DE95003843	WHC-SD-WM-QAPP-009-Rev.1	DE95003998	WHC-SD-WM-DA-177
DE95003266	DOE/RL-89-12-Rev.2-Draft-A	DE95003844	WHC-SD-W026-PLN-004	DE95003999	WHC-SD-WM-DP-0076
DE95003267	WHC-EP-0474-14	DE95003845	WHC-SD-WM-TC-066	DE95004000	WHC-SD-WM-TP-229
DE95003269	DOE/RL-94-29	DE95003846	WHC-SD-W025-EMS-002	DE95004101	WHC-SD-WM-WP-291
DE95003270	WHC-SD-WM-TI-577-Rev.1	DE95003847	WHC-SD-WM-TI-672	DE95004102	WHC-EP-0739
DE95003271	WHC-SD-WM-PICD-001	DE95003848	WHC-SD-WM-TP-277-Rev.1	DE95004103	WHC-SD-W100-ES-009
DE95003272	WHC-SA-2209	DE95003849	WHC-SD-WM-DB-025	DE95004104	WHC-SA-1601
DE95003273	WHC-SA-2210	DE95003850	WHC-SD-T100-PLN-001	DE95004107	WHC-SD-PRP-HA-015
DE95003274	WHC-SD-WM-ER-386	DE95003851	WHC-SD-W105-OTR-003	DE95004108	WHC-SD-W026-SDP-001
DE95003275	WHC-SD-WM-TP-231	DE95003852	WHC-SD-T100-CDR-001	DE95004110	WHC-SD-W236A-RPT-004
DE95003276	WHC-SD-WM-ATP-107	DE95003853	WHC-SA-2709	DE95004111	WHC-SD-W025-ATR-001-Rev.1
DE95003277	WHC-SD-WM-PSE-010	DE95003854	WHC-SD-WM-TRP-197	DE95004112	WHC-SD-WM-SEL-033-Rev.1
DE95003278	WHC-SD-W320-DA-005	DE95003855	WHC-SD-SNF-WP-011	DE95004145	DOE/RL-94-106
DE95003279	WHC-SD-WM-AP-029	DE95003856	WHC-SD-WM-DA-166	DE95004146	WHC-SD-W236B-FRD-002-Rev.1
DE95003280	WHC-SD-W320-DA-004	DE95003857	WHC-SD-EN-AP-181	DE95004147	WHC-SD-SQA-CSA-20382
DE95003281	WHC-SD-WM-IP-007	DE95003858	WHC-SD-W236A-TI-016	DE95004148	WHC-SD-EN-TP-047-Rev.1
DE95003282	WHC-SD-WM-OTR-155	DE95003859	WHC-SD-GN-TRP-20025	DE95004149	WHC-SD-WM-ETP-118
DE95003293	DOE/EM-0201	DE95003860	WHC-SD-FF-SSP-004-Rev.1	DE95004150	WHC-SD-WM-TP-193
DE95003294	DOE/EM-0202	DE95003861	WHC-SD-SNF-ER-002	DE95004151	WHC-SD-SNF-TRP-001
DE95003306	WHC-SD-W025-PLN-002	DE95003862	WHC-SD-EN-TI-271	DE95004152	WHC-SD-RTG-WP-001
DE95003309	DOE/LLW-205	DE95003863	WHC-SD-W370-ER-001	DE95004153	WHC-SD-WM-RD-049
DE95003329	WHC-SD-L116-CDR-001	DE95003864	WHC-SD-W370-FDC-001	DE95004154	WHC-SD-L045H-CSWD-002
DE95003363	WHC-SD-W320-ANAL-003	DE95003865	WHC-SD-GN-TRP-20014	DE95004155	WHC-SD-WM-ATP-115
DE95003457	LA-SUB-94-154	DE95003866	WHC-SD-TP-RPT-015	DE95004157	WHC-SD-WM-ANAL-036
DE95003460	WSRC-MS-94-0569	DE95003867	WHC-SD-WM-PLN-081-Rev.3	DE95004158	WHC-SD-W025-VI-001-Rev.1
DE95003622	DOE/EM-0222	DE95003868	WHC-SD-WM-ER-390	DE95004159	WHC-SD-WM-ATP-114
DE95003639	WHC-SD-WM-CSWD-067	DE95003869	WHC-SD-W242-ES-003	DE95004160	WHC-SD-CP-OTR-151
DE95003690	LA-UR-94-3825	DE95003871	WHC-SD-W236A-ER-010	DE95004161	WHC-SD-HWV-PLN-002-Rev.5
DE95003698	LA-UR-94-3865	DE95003886	DOE/AL/62350-132-Rev.1	DE95004162	WHC-SD-CP-TC-031
DE95003719	LA-UR-94-3724	DE95003887	DOE/EA-0347-Rev.2	DE95004163	WHC-SA-2565
DE95003736	CONF-941244-Summ.	DE95003888	DOE/EA-0464-Rev.5	DE95004186	ANL/EAD/TM-33
DE95003737	CONF-941244-2-Rev.1	DE95003889	DOE/AL/62350-64-Rev.1	DE95004196	UCRL-ID-117120
DE95003738	CONF-941244-1	DE95003890	DOE/AL/62350-149	DE95004221	ORNL/TM-12250
DE95003752	LA-UR-94-228	DE95003891	DOE/AL/62350-159	DE95004226	PNL-10163
DE95003754	LA-UR-94-1510	DE95003901	ORNL/ER-261	DE95004230	LA-12861-MS
DE95003756	DOE/EM-0216	DE95003902	ORNL/ER-268	DE95004244	DOE/EM-0198
DE95003762	SD-WM-TI-230-Rev.2	DE95003903	ES/ERTM-136	DE95004245	DOE/EM-0197
DE95003763	WHC-SD-W049H-ATP-003	DE95003906	WSRC-MS-94-0567	DE95004246	PNL-10191
DE95003764	WHC-SD-W049H-ATP-002	DE95003908	DOE/AL/62350-116	DE95004273	ANL/EAD/TM-34
DE95003765	WHC-SD-CP-DA-093	DE95003909	DOE/AL/62350-79-Rev.1	DE95004275	PNL-10081
DE95003766	WHC-SD-WM-ER-395	DE95003910	DOE/AL/62350-56-Rev.5	DE95004276	PNL-10171
DE95003767	WHC-SD-CP-TP-079	DE95003911	DOE/AL/62350-134	DE95004277	PNL-10209
DE95003768	WHC-SD-WM-ETP-129	DE95003912	DOE/AL/62350-167	DE95004278	PNL-10240
DE95003769	WHC-SD-WM-TP-277	DE95003913	DOE/AL/62350-168	DE95004344	WSRC-RP-94-00780
DE95003770	WHC-SD-CP-TP-080	DE95003914	DOE/AL/62350-169-Rev.1	DE95004358	PNL-8901
DE95003771	WHC-SD-WM-ETP-128	DE95003915	DOE/AL/62350-76-Rev.6	DE95004359	PNL-10161
DE95003772	WHC-SD-T100-QAPP-001	DE95003916	DOE/AL/62350-153	DE95004360	DOE/RL-89-28-Rev.2
DE95003773	WHC-SD-WM-TRP-208	DE95003917	DOE/AL/62350-5-Rev.1	DE95004361	WHC-SD-W151-QAPP-001-Rev.2
DE95003775	WHC-SD-L045H-RRR-001-Rev.1	DE95003918	DOE/AL/62350-101	DE95004362	WHC-SA-2505
DE95003776	WHC-SD-SNF-WP-010	DE95003924	DOE/AL/62350-T4	DE95004363	WHC-SD-W151-TI-002
DE95003777	WHC-SD-SNF-PMP-002	DE95003925	DOE/AL/62350-T5	DE95004364	WHC-SD-WM-EMP-032
DE95003778	WHC-SD-L045H-CSCM-001	DE95003926	DOE/AL/62350-T6	DE95004365	WHC-SD-WM-ER-393
DE95003779	WHC-SD-L045H-RPT-001	DE95003944	WHC-SD-WM-TP-266		
DE95003780	WHC-SD-WM-CSDD-004	DE95003945	WHC-SA-2690		
DE95003781	WHC-SD-WM-ATP-112				

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DE95004366	WHC-SD-SNF-FVP-001	DE95004740	DOE/OR-01-1311-D2	DE95005024	EGG-M-94302
DE95004370	WHC-SD-EN-TI-229	DE95004741	DOE/OR-1047-D2	DE95005025	EGG-M-94073
DE95004371	WHC-SD-WM-DP-077	DE95004742	DOE/OR-01-1258-D2	DE95005026	EGG-M-94275
DE95004381	SAND-94-8699C	DE95004744	ES/ER/TM-123	DE95005030	EGG-M-94112
DE95004386	SAND-91-1526	DE95004745	DOE/OR-01-1290-D1	DE95005035	EGG-M-94023
DE95004387	PNL-10060	DE95004747	WHC-SD-WM-TA-156	DE95005036	EGG-M-94071
DE95004403	WHC-SD-W025-FDR-001- Rev.1-Vol.1-2	DE95004749	WHC-SD-W151-ANAL-001	DE95005037	EGG-M-94179
DE95004410	WSRC-TR-94-0286-E-Rev.1	DE95004750	WHC-SD-SQA-CSA-20381	DE95005038	EGG-M-94401
DE95004418	WHC-SD-W100-DTR-003	DE95004751	WHC-SD-WM-OTP-168	DE95005040	EGG-M-94180
DE95004419	WHC-SD-WM-ATP-111- Rev.1	DE95004752	WHC-SD-WM-DA-144	DE95005044	EGG-NRE-11457
DE95004422	WHC-SD-WM-OTP-161	DE95004753	WHC-SD-NR-CSE-014- Rev.1	DE95005050	WHC-SD-W112-SDRD-001
DE95004424	WHC-SD-W314B-DA-002	DE95004754	WHC-SD-W337-ATP-001	DE95005051	WHC-SD-WM-TI-680
DE95004427	WHC-SD-WM-EV-014-Rev.2	DE95004755	WHC-SD-WM-SARR-012- Rev.1	DE95005052	WHC-SD-WM-TA-154
DE95004428	DOE/EM-0089T-Rev.2	DE95004756	WHC-SD-PRP-HA-014	DE95005054	WHC-EP-0532-Rev.2
DE95004429	WHC-SD-WM-ATP-117	DE95004776	SAND-94-2313C	DE95005055	WHC-EP-0813
DE95004430	WHC-SD-W236A-ER-014	DE95004785	WHC-SD-W340-ES-002	DE95005056	WHC-EP-0829
DE95004431	WHC-SD-CP-RD-022-Rev.1	DE95004786	WHC-SD-L225-ATP-001	DE95005057	WHC-SD-WM-DP-080
DE95004432	WHC-SD-WM-TI-540-Rev.1	DE95004788	WHC-SD-SNF-PTR-001	DE95005062	PNL-10210
DE95004470	WHC-SD-W049H-CSRS-001	DE95004789	WHC-SD-WM-ER-349	DE95005065	WHC-SD-W402-FHA-001
DE95004471	WHC-SD-W025-EMS-002- Rev.1	DE95004790	WHC-SD-WM-ER-352	DE95005066	WHC-SD-W113-SDRD-001
DE95004472	WHC-SD-W049H-ICD-001- Rev.1	DE95004813	ANL/ESD/TM-73	DE95005068	WHC-SD-TD-ICD-001
DE95004474	WHC-SD-W320-QAPP-001- Rev.1	DE95004816	LBL-36086	DE95005069	WHC-SD-CP-HC-004
DE95004484	WHC-SD-RE-SEL-001-Rev.2	DE95004817	LBL-36088	DE95005070	WHC-SD-WM-TP-296
DE95004485	WHC-SD-CP-OMM-003	DE95004858	DOE/OR/22160-T14	DE95005071	WHC-SD-WM-ES-330
DE95004486	WHC-SD-WM-SDP-011	DE95004859	DOE/OR/22160-T15	DE95005072	WHC-SD-WM-WP-293
DE95004487	WHC-SD-CP-RPT-012- Rev.1	DE95004872	DOE/RL-94-76	DE95005073	WHC-SD-W413-FHA-001
DE95004488	WHC-SA-2407	DE95004874	ES/ER/TM-102/R1	DE95005074	WHC-SD-WM-AP-033
DE95004490	WHC-SD-WM-TI-608-Rev.1	DE95004896	PNL-SA-25345	DE95005075	WHC-SD-CP-TI-194
DE95004491	WHC-SD-SQA-CSA-20384	DE95004898	PNL-SA-24072	DE95005076	WHC-SD-WM-ATR-069- Rev.1
DE95004492	WHC-SD-GN-TRP-20026	DE95004899	PNL-SA-20502	DE95005077	WHC-SD-WM-TI-386
DE95004494	WHC-SD-SNF-SARR-004	DE95004900	PNL-SA-23718	DE95005079	WHC-SD-WM-EV-053-Rev.2
DE95004495	WHC-SD-SNF-CSE-002	DE95004902	PNL-SA-24222	DE95005080	WHC-SD-W049H-ATR-003
DE95004496	WHC-SD-WM-TI-634-Rev.1	DE95004903	PNL-SA-25362	DE95005081	WHC-SD-WM-ATP-080
DE95004497	WHC-SD-EN-EV-030	DE95004911	PNL-SA-24683	DE95005082	WHC-SD-CP-HSP-002
DE95004498	WHC-SD-W340-WP-002	DE95004924	PNL-SA-25469	DE95005083	WHC-SD-SNF-PMP-008
DE95004499	WHC-SD-WM-OTR-163	DE95004926	PNL-SA-24698	DE95005097	WHC-SD-WM-DA-183
DE95004500	WHC-SD-WM-RPT-099	DE95004931	PNL-SA-20933	DE95005098	WHC-SD-WM-ATP-106
DE95004501	WHC-SD-WM-OTP-167	DE95004932	PNL-SA-24289	DE95005099	WHC-SD-EN-TI-253
DE95004502	WHC-SD-WM-TI-666	DE95004935	PNL-SA-24993	DE95005100	WHC-SD-SNF-RA-001
DE95004503	WHC-SD-WM-ER-332	DE95004936	PNL-SA-24741	DE95005101	WHC-SD-WM-TI-638
DE95004505	DOE/EM-0223-Vol.1	DE95004937	PNL-SA-25050	DE95005103	WHC-SD-WM-ATP-004
DE95004506	DOE/EM-0223-Vol.2	DE95004940	PNL-SA-23775	DE95005104	WHC-SD-W236A-PLN-002
DE95004508	WHC-SD-EN-TI-241	DE95004943	FEMP-2394	DE95005105	WHC-SD-W236A-TI-004
DE95004510	WHC-SD-WM-ATP-093	DE95004945	FEMP-2396	DE95005132	WHC-SD-WM-TP-285
DE95004511	WHC-SA-2666	DE95004949	DOE/RL-94-46	DE95005133	WHC-SD-CP-TR-006
DE95004512	WHC-SD-EN-TI-292	DE95004950	BNL-61127	DE95005134	WHC-SD-EN-TP-050
DE95004524	SAND-94-2136C	DE95004957	PNL-SA-23952	DE95005135	WHC-SD-WM-RPT-099- Rev.1
DE95004525	SAND-94-2134C	DE95004967	UCRL-JC-110055-Rev.1	DE95005136	WHC-SD-SNF-CR-002
DE95004527	SAND-94-1718C	DE95004971	WHC-SD-WM-WP-284	DE95005137	WHC-SD-W025-RPT-003
DE95004559	PNL-SA-24027	DE95004972	PNL-SA-24239	DE95005138	WHC-SD-WM-FHA-003
DE95004560	PNL-SA-24672	DE95004973	WHC-SA-2745	DE95005139	WHC-SA-2540
DE95004561	PNL-SA-21497	DE95004974	WHC-SA-2753	DE95005140	WHC-SD-SNF-PCP-001- Rev.1
DE95004564	PNL-SA-24144	DE95004975	WHC-EP-0834	DE95005141	WHC-SD-FF-EV-002
DE95004572	PNL-SA-23839	DE95004976	WHC-SP-1108	DE95005142	WHC-SD-WM-PLN-071
DE95004578	PNL-SA-23723	DE95004977	WHC-SD-WM-TP-206	DE95005143	WHC-SD-WM-ER-397
DE95004644	ANL/CMT/PP-82412	DE95004978	WHC-SD-WM-TP-293	DE95005144	WHC-SD-W405-CR-001
DE95004650	ANL/EA/CP-84292	DE95004980	WHC-MR-0483	DE95005145	WHC-SD-WM-TPH-016- Rev.3
DE95004652	ANL/EWM/CP-83384	DE95004981	WHC-SD-W026-TC-002	DE95005146	WHC-SD-WM-TP-219-Rev.2
DE95004661	ANL/EA/SUMM-84626	DE95004982	DOE/LLW-114-Rev.1	DE95005147	WHC-SD-WM-UM-029
DE95004714	PNL-10275	DE95004984	DOE/EM-0226	DE95005160	WHC-SA-2549
DE95004730	ORNL/ER-264	DE95004986	PNL-10170	DE95005161	WHC-SA-2544
DE95004733	ORNL/ER-169/S3	DE95004987	PNL-10196	DE95005162	WHC-SD-GN-ER-30034
DE95004734	ORNL/TM-12828	DE95004988	PNL-10281	DE95005163	WHC-SD-WM-CM-012
DE95004736	ORNL/ER/Sub-87-99053/28	DE95004996	ORNL-6846	DE95005164	WHC-SD-SP-PHA-001
DE95004739	ES/ER/TM-113	DE95004997	EGG-WTD-11446	DE95005165	WHC-SD-TP-PDC-026
		DE95005003	BNL-61006	DE95005166	WHC-SD-SQA-CSA-20383
		DE95005006	WSRC-MS-94-0590	DE95005167	WHC-SD-SQA-CSA-20376
		DE95005018	EGG-M-94234		
		DE95005020	EGG-M-94040		

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DE95005168	WHC-SD-WM-TI-675	DE95005473	WHC-SD-WM-UM-027	DE95005679	WHC-SD-WM-SEL-012-Rev.4
DE95005169	WHC-SD-WM-DP-065	DE95005474	WHC-SD-WM-SDD-041	DE95005680	WHC-SD-W025-ATP-002
DE95005214	WHC-SD-W320-TIS-001-Rev.2	DE95005475	WHC-SD-WM-TP-254	DE95005681	WHC-SD-WM-ATP-107-Rev.1
DE95005216	WHC-SD-WM-TI-656-Rev.1	DE95005476	WHC-EP-0795	DE95005682	WHC-SD-WM-TC-054
DE95005217	WHC-SD-SNF-CR-001	DE95005477	WHC-EP-0839	DE95005683	WHC-SD-W049H-ATR-002
DE95005218	WHC-SD-WM-ETP-125	DE95005478	WHC-SA-2707	DE95005684	WHC-SD-WM-SDD-043
DE95005220	WHC-SD-CP-TP-082	DE95005480	WSRC-RP-95-0040	DE95005693	ORN/ER-291
DE95005221	DOE/NTP-94-1040	DE95005481	WSRC-TR-94-0538	DE95005730	LA-SUB-95-4
DE95005222	DOE/NTP-94-1041	DE95005482	WSRC-MS-95-0010	DE95005734	LA-SUB-95-7
DE95005223	WHC-SD-SNF-ER-006	DE95005483	WSRC-RP-90-1127	DE95005735	ORN/ER-281
DE95005224	WHC-SD-WM-ATR-110	DE95005484	WSRC-RP-94-396	DE95005736	ORN/ER-286
DE95005225	WHC-SD-WM-SDD-048	DE95005485	WSRC-MS-94-0595	DE95005742	LA-12753-MS
DE95005226	WHC-SD-SNF-FRD-003	DE95005486	WSRC-TR-94-0544	DE95005743	LA-12752-MS
DE95005228	WHC-SD-WM-FDC-041	DE95005533	WHC-SD-WM-ES-300-Rev.1	DE95005744	LA-12857-ENV
DE95005229	WHC-SD-W306-SDRD-001	DE95005595	WHC-SD-WM-TP-147	DE95005752	PNL-10194
DE95005234	WHC-SD-W025-ATR-002	DE95005596	WHC-SD-WM-CSWD-069	DE95005754	PNL-10134
DE95005254	LA-UR-94-4316	DE95005597	WHC-SD-WM-TI-363	DE95005776	DOE/SR/18445-T1
DE95005256	BHI-00007	DE95005598	WHC-SP-1112	DE95005797	DOE/CH/10575-T2
DE95005280	WHC-SD-CP-SA-027	DE95005599	WHC-SP-1149	DE95005840	ANL/ET/CP-82489
DE95005281	WHC-SD-WM-TI-667	DE95005600	WHC-EP-0831	DE95005851	ANL/EA/CP-84367
DE95005282	WHC-SD-WM-TA-159	DE95005601	WHC-SD-WM-FDC-042	DE95005865	ANL/EA/CP-82216
DE95005283	WHC-SD-WM-DP-075	DE95005603	WHC-SD-W007H-ATR-002	DE95005872	ANL/CMT/CP-84355
DE95005284	WHC-SD-W337-OTP-001	DE95005604	WHC-SD-WM-TP-294	DE95005880	ANL-94/33
DE95005285	WHC-SD-TD-WP-0050	DE95005605	WHC-SD-WM-ANAL-038	DE95005881	WSRC-RP-94-1272
DE95005286	WHC-SD-FF-DRR-00018	DE95005607	WHC-SD-L205-ATP-001	DE95005882	DOE/OR-01-1292-D2
DE95005287	WHC-SD-WM-SDD-024	DE95005608	WHC-SD-L097-ATP-005	DE95005885	WSRC-MS-94-0203P
DE95005288	WHC-SD-T100-PMP-001	DE95005616	ANL-94/29	DE95005912	UCRL-CR-118921
DE95005289	WHC-SD-W320-DA-001	DE95005617	WHC-SD-WM-ER-399-Rev.	DE95005932	WHC-SD-WM-DP-081
DE95005290	WHC-SD-WM-TC-005	DE95005619	WHC-SD-WM-SP-006	DE95005935	WHC-SD-W025-RPT-001
DE95005291	WHC-SD-F031-QAPP-001	DE95005620	WHC-SD-W087-PMP-001-Rev.1	DE95005961	PNL-SA-25615
DE95005292	WHC-SD-SNF-SARR-002-Rev.3	DE95005621	WHC-SD-W306-TI-003	DE95005963	CONF-941088-1
DE95005293	WHC-SD-WM-ATR-082	DE95005622	WHC-SD-SNF-SARR-003	DE95005975	WHC-SD-WM-ANAL-039
DE95005294	WHC-SD-F031-PMP-002	DE95005623	WHC-SD-WM-TP-180	DE95005976	WHC-SD-WM-TP-298
DE95005295	WHC-SD-SNF-HC-002	DE95005624	WHC-SD-WM-VI-014	DE95005977	WHC-SD-WM-PICD-006
DE95005296	WHC-SD-WM-TP-286	DE95005625	WHC-SD-WM-FHA-006	DE95005978	WHC-SD-WM-TP-286-Rev.1
DE95005298	WHC-SD-W320-PMP-001-Rev.3	DE95005626	WHC-SD-WM-AP-005-Rev.5	DE95005979	WHC-SD-WM-TRP-211
DE95005299	WHC-SD-WM-SOIL-001	DE95005627	WHC-SD-WM-OTP-171	DE95005980	WHC-SD-WM-OTP-170
DE95005389	CONF-9409285-1	DE95005628	WHC-SD-EN-DP-090	DE95005982	WHC-EP-0832
DE95005398	PNL-10370	DE95005629	WHC-SD-EN-PRS-002	DE95005983	WHC-SA-2756
DE95005400	PNL-SA-25177	DE95005630	WHC-SD-SNF-AP-001	DE95005984	WHC-SA-2755
DE95005402	PNL-SA-20950	DE95005631	WHC-SD-EN-TI-282	DE95005985	WHC-SD-W236A-ER-015
DE95005403	PNL-SA-24093	DE95005632	WHC-SD-SNF-FRD-007	DE95005986	WHC-SD-WM-OTR-170
DE95005405	WHC-SD-EN-RA-007	DE95005633	WHC-SD-SNF-SARR-002-Rev.2	DE95005987	WHC-SD-WM-TRP-229
DE95005412	WHC-SD-WM-DP-079	DE95005635	WHC-SP-1139	DE95005988	WHC-SD-WM-DP-073
DE95005425	SAND-94-0599C	DE95005636	WHC-SD-WM-PLN-055-Rev.2	DE95005989	WHC-SD-WM-ATP-113
DE95005428	SAND-95-0014C	DE95005637	WHC-SD-WM-TP-295	DE95005990	WHC-SD-WM-WP-218-Rev.1
DE95005429	WHC-SD-WM-ER-391	DE95005638	WHC-SD-WM-CM-002	DE95005991	WHC-SD-WM-ANAL-040
DE95005430	WHC-SD-WM-ES-316	DE95005639	WHC-SD-WM-TP-268	DE95005997	ORN/ET/CP-82489
DE95005431	WHC-SD-WM-DB-026	DE95005640	WHC-SD-EN-TI-223	DE95006074	LA-12831-MS
DE95005432	WHC-SD-SNF-ER-005	DE95005641	WHC-SD-ETI-TA-001	DE95006076	DOE/EM-0224
DE95005433	WHC-SD-WM-DA-179	DE95005642	WHC-SD-SNF-HC-001	DE95006141	RFP-4900
DE95005434	WHC-SD-WM-VI-011	DE95005643	WHC-SD-SNF-EDL-001	DE95006153	DOE/MC/28245-3922
DE95005435	WHC-SD-CP-TP-077-Rev.1	DE95005644	WHC-SD-SNF-FDC-001-Rev.1	DE95006155	ANL-94/38
DE95005436	WHC-SD-WM-TP-241	DE95005645	WHC-SD-SNF-TA-002	DE95006164	CONF-9304128-24
DE95005437	WHC-SD-WM-SAD-016-Rev.2	DE95005646	WHC-SD-SNF-TA-003	DE95006165	CONF-9304128-22
DE95005438	PNL-10249	DE95005647	WHC-SD-W100-TI-009	DE95006193	PNL-10398-Vol.1
DE95005439	WHC-SD-ER3297-TS-001-Rev.1	DE95005648	WHC-SD-WM-DP-078	DE95006194	PNL-10398-Vol.2
DE95005440	WHC-SD-W049-ATR-001	DE95005649	WHC-SD-PRP-HA-017	DE95006200	SAND-95-8007
DE95005462	WHC-SD-LEF-TS-001	DE95005650	WHC-SD-W007H-ATR-001	DE95006208	DOE/MC/29109-3979
DE95005463	WHC-SD-SNF-TI-002	DE95005651	LA-12889	DE95006217	DOE/MC/29109-3978
DE95005464	WHC-SD-TD-CR-001	DE95005652	LA-12863	DE95006218	DOE/MC/29109-3977
DE95005465	WHC-SD-EN-TI-263	DE95005672	WHC-SD-W058-WP-001	DE95006225	SAND-95-0070C
DE95005466	WHC-SD-W236A-SDRD-001-Rev.1	DE95005673	WHC-SD-WM-RPT-105	DE95006239	PNL-10260
DE95005470	WHC-EP-0807	DE95005674	WHC-SD-WM-OTP-172	DE95006264	LA-UR-95-201
DE95005472	WHC-SD-WM-ATP-122	DE95005676	WHC-SD-WM-ATR-117	DE95006273	LA-UR-95-346
		DE95005677	WHC-SD-WM-SDD-054	DE95006280	LA-UR-95-322
		DE95005678	WHC-SD-SNF-ATP-004	DE95006282	LA-UR-95-376
				DE95006286	LA-UR-95-410

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DE95006289	LA-UR-95-381	DE95006780	WHC-SD-CP-TI-108-Rev.14	DE95007159	PNL-SA-24315
DE95006292	LA-UR-95-212	DE95006781	WHC-SD-CP-TRP-060	DE95007160	PNL-SA-24340
DE95006297	LA-UR-95-107	DE95006782	WHC-SD-W151-WP-005	DE95007161	PNL-SA-24355
DE95006305	SAND-94-2409C	DE95006784	WHC-SD-WM-FDC-036	DE95007166	PNL-SA-24110
DE95006309	SAND-95-0117C	DE95006786	WHC-SD-WM-ANAL-043	DE95007167	PNL-SA-24002
DE95006326	LA-UR-95-198	DE95006787	WHC-SD-WM-WP-295	DE95007173	WHC-SD-SNF-ES-006
DE95006334	LA-UR-95-90	DE95006788	WHC-SD-WM-OTP-169	DE95007174	WHC-SD-WM-ETP-138
DE95006335	LA-UR-95-78	DE95006789	WHC-SD-WM-DP-082	DE95007175	WHC-SD-WM-TP-290
DE95006367	PNL-10185	DE95006790	WHC-SD-W314-FRD-001	DE95007176	WHC-SD-SNF-DA-004
DE95006368	PNL-10283	DE95006791	WHC-SD-SNF-ATP-006	DE95007178	WHC-SD-SNF-SM-001
DE95006370	PNL-10415	DE95006792	WHC-SD-SQA-TA-20015-Rev.1	DE95007179	WHC-SD-WM-ES-328
DE95006386	CONF-941207-20	DE95006793	WHC-SD-SNF-TA-005	DE95007180	WHC-SD-WM-TP-302
DE95006391	CONF-950232-31	DE95006794	WHC-SD-SNF-TA-004	DE95007181	WHC-SD-SN-ICD-20001
DE95006395	DOE/DP/48070-T1	DE95006795	ORNL/TM-12245	DE95007182	WHC-SD-SNF-TP-010
DE95006431	UCRL-ID-118926	DE95006797	ORNL/TM-12876	DE95007184	WHC-EP-0835
DE95006442	UCRL-ID-118122	DE95006798	WHC-EP-0394-9	DE95007185	WHC-SP-1147
DE95006447	LA-UR-94-3121	DE95006799	WHC-SA-2621	DE95007186	WHC-SA-2595
DE95006448	LA-UR-94-3114	DE95006800	DOE/RL-94-36-3	DE95007187	WHC-SP-0665-15
DE95006449	LA-UR-94-3120	DE95006802	WHC-SD-W236A-TI-010-Rev.1	DE95007188	WHC-SD-WM-OMM-015
DE95006454	WSRC-MS-94-0618	DE95006819	SAND-95-0143C	DE95007189	WHC-SD-SNF-CM-002
DE95006455	WSRC-MS-94-0617	DE95006823	SAND-94-2564C	DE95007190	DOE/RL-94-106-Rev.1
DE95006456	WSRC-MS-94-0619	DE95006825	SAND-95-0142C	DE95007193	WHC-SD-W049H-RRF-001
DE95006458	SAND-95-0172C	DE95006826	WHC-SD-WM-TP-200	DE95007195	WHC-SD-WM-TP-284
DE95006463	WSRC-MS-94-0658	DE95006827	WHC-SD-SQA-CSA-20387	DE95007196	WHC-SD-WM-TP-228
DE95006474	WSRC-RP-94-532	DE95006828	WHC-SD-WM-ATR-066	DE95007217	WHC-SD-WM-TP-249
DE95006489	PNL-10400-Draft	DE95006832	WHC-SD-LL-ATR-020	DE95007218	WHC-SD-WM-TP-216
DE95006492	ORNL/TM-12631	DE95006835	WHC-EP-0830-Vol.3	DE95007219	WHC-SD-W236A-MP-001-Rev.1
DE95006502	SAND-94-2388	DE95006836	WHC-SA-2705	DE95007221	WHC-SD-W272-HC-001-Rev.1
DE95006581	LBL-35569	DE95006841	DOE/EA-0843	DE95007223	WHC-SD-SQA-TA-20010-Rev.1
DE95006595	WHC-SD-W007H-FDC-001-Rev.3	DE95006848	WHC-SD-FF-TA-034	DE95007224	WHC-SD-CP-TC-032-Rev.1
DE95006596	WHC-SD-W151-ATP-001-Rev.1	DE95006849	WHC-SD-CP-PLN-028	DE95007225	WHC-SD-SNF-WP-012
DE95006598	WHC-SD-W236A-TI-013	DE95006850	WHC-SD-PRP-HA-001-Rev.2	DE95007226	WHC-SD-LEF-TS-001-Rev.1
DE95006599	WHC-SD-W236A-TI-005	DE95006856	LA-12821-MS	DE95007227	WHC-SD-CP-ES-166
DE95006600	WHC-SD-W236A-TI-010	DE95006876	WHC-SD-W252-ACDR-001	DE95007228	WHC-SD-SNF-TRP-002
DE95006629	WHC-SA-2633	DE95006882	WHC-SD-CP-ES-165	DE95007264	PNL-9785
DE95006630	WHC-SD-W236A-TI-007	DE95006883	WHC-SD-W178-PMP-001	DE95007267	PNL-SA-24087
DE95006631	WHC-SD-W236A-TI-008	DE95006884	WHC-SD-W402-CR-001-Rev.2	DE95007268	PNL-SA-23947
DE95006635	ES/ESH-53	DE95006885	WHC-SA-2609	DE95007280	PNL-SA-24123
DE95006651	WHC-SD-SNF-TI-006	DE95006886	WHC-SD-W026-PLN-005	DE95007281	PNL-SA-24036
DE95006652	WHC-SD-WM-SDD-055	DE95006887	WHC-SD-W236A-WP-002	DE95007282	PNL-SA-25159
DE95006653	WHC-SD-SNF-TP-008-Rev.1	DE95006888	WHC-SD-WM-EV-096	DE95007283	PNL-SA-24081
DE95006654	WHC-SD-W236A-TI-014	DE95006889	WHC-SD-WM-UM-019	DE95007284	PNL-SA-24702
DE95006655	WHC-SD-W236A-TI-009	DE95006890	WHC-SD-WM-TP-207-Rev.1	DE95007285	PNL-SA-24508
DE95006656	WHC-SD-W236A-TI-006	DE95006891	WHC-SD-WM-TP-227-Rev.1	DE95007287	PNL-SA-24754
DE95006657	WHC-SD-CP-OTP-152-Rev.1	DE95006893	WHC-SD-CP-ANAL-008	DE95007301	BNL-61292
DE95006658	WHC-SD-C217-ES-001	DE95006894	WHC-SD-WM-TI-682	DE95007346	DOE/MC/31388-95/C0423
DE95006659	WHC-SD-W236A-TI-011	DE95006895	WHC-SD-WM-ETP-107	DE95007348	DOE/MC/29115-95/C0415
DE95006671	ES/ESH-54	DE95006896	WHC-SD-WM-PLN-096	DE95007349	DOE/MC/29104-95/C0411
DE95006672	ES/ESH-51	DE95006897	WHC-SD-WM-TP-217-Rev.1	DE95007365	CONF-9410300-1
DE95006673	ES/ESH-50	DE95006898	WHC-SD-WM-TP-288	DE95007369	CONF-950232-20
DE95006706	WHC-SD-TP-RPT-018	DE95006902	WHC-SD-WM-TI-665	DE95007379	CONF-950232-10
DE95006707	WHC-SD-TP-RPT-017	DE95006903	WHC-SD-WM-OTR-172	DE95007413	WHC-SD-WM-DP-067-Add.1A
DE95006711	WHC-SD-CP-ANAL-010	DE95006904	WHC-SD-WM-ER-383	DE95007478	WHC-EP-0750-Vol.1-Rev.1
DE95006719	LBL-36211	DE95006905	WHC-SD-WM-TP-250	DE95007479	WHC-EP-0750-Vol.2-Rev.1
DE95006722	LBL-36385	DE95006906	WHC-SD-WM-ETP-135	DE95007480	WHC-EP-0750-Vol.3-Rev.1
DE95006725	LBL-34468	DE95006907	WHC-SD-WM-ATP-077-Rev.2	DE95007481	WHC-EP-0750-Vol.4-Rev.1
DE95006727	LBL-36212	DE95006908	WHC-SD-WM-TI-674	DE95007482	WHC-EP-0750-Vol.5-Rev.1-2
DE95006728	BNL-52444	DE95006909	WHC-SD-WM-SARR-031	DE95007483	WHC-EP-0750-Vol.6-Rev.1
DE95006729	BNL-52452	DE95007008	CONF-9409219-7	DE95007484	WHC-EP-0750-Vol.7-Rev.1
DE95006731	DOE/RL-91-50-Rev.1	DE95007023	CONF-940815-110	DE95007491	DOE/EW/50619-T1
DE95006738	CONF-9408136-3	DE95007035	CONF-950232-21	DE95007495	DOE/MC/29249-95/C0421
DE95006739	CONF-940983-5	DE95007074	DOE/OR/22160-T16	DE95007496	DOE/MC/29107-95/C0412
DE95006761	WHC-SD-WM-TRP-212	DE95007091	DOE/RL-93-99-Rev.1	DE95007497	DOE/MC/30359-95/C0420
DE95006767	WHC-SA-2723	DE95007124	ORNL/TM-12848	DE95007498	DOE/MC/29120-95/C0416
DE95006768	WHC-SA-2696	DE95007130	ANL/IPNS/CP-85110	DE95007523	PNL-9434-Rev.1
DE95006777	WHC-SD-WM-TP-218-Rev.1	DE95007155	PNL-SA-23997	DE95007560	WHC-SA-1196-Rev.1
DE95006778	WHC-SD-W236B-EV-001-Rev.2			DE95007565	DOE/MC/29104-95/C0436

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DE95007566	DOE/MC/30358-95/C0432	DE95007797	PNL-SA-24429	DE95008214	DOE/NV-380
DE95007567	DOE/MC/29106-95/C0427	DE95007800	PNL-SA-23770	DE95008216	DOE/EA-0984-Draft-B
DE95007568	DOE/MC/29107-95/C0413	DE95007802	PNL-SA-24899	DE95008217	DOE/RL-94-66-Draft-A
DE95007569	DOE/MC/30357-95/C0418	DE95007804	PNL-SA-25549	DE95008218	DOE/RL-93-33-Draft-A
DE95007570	DOE/MC/29467-95/C0426	DE95007810	PNL-SA-24451	DE95008219	DOE/RL-94-64-Draft-A
DE95007596	DOE/RL-93-83	DE95007812	PNL-SA-24505	DE95008220	DOE/RL-94-47-Rev.1
DE95007597	DOE/RL-91-46-Draft-D	DE95007816	PNL-SA-24388	DE95008221	DOE/RL-94-43-Rev.1
DE95007598	DOE/RL-91-46-Draft-E	DE95007818	WHC-MR-0489	DE95008222	DOE/RL-94-65-Draft-A
DE95007600	DOE/RL-93-54-Draft-A	DE95007819	ANL-94/47	DE95008269	ANL/ER/CP-83078
DE95007601	DOE/RL-93-98-Rev.1	DE95007832	LA-UR-95-748	DE95008274	ANL/CMT/CP-85759
DE95007602	DOE/RL-93-96-Rev.1	DE95007849	LA-UR-95-698	DE95008276	ANL/CMT/CP-85758
DE95007603	DOE/RL-90-22-Draft-F	DE95007869	LA-UR-95-174	DE95008277	ANL/TD/CP-84267
DE95007605	DOE/AL/62350-152-Rev.1	DE95007951	PNL-10417	DE95008279	ANL/EA/CP-84167
DE95007606	CONF-950268-3	DE95007952	PNL-10359-Vol.1	DE95008280	ANL/EA/CP-85594
DE95007607	DOE/AL/62350-181	DE95007953	PNL-10359-Vol.2	DE95008281	ANL/EA/CP-85596
DE95007608	CONF-930483-15	DE95007954	PNL-10187	DE95008284	ANL/EA/CP-84165
DE95007609	DOE/AL/62350-175	DE95007955	ANL-94/43	DE95008286	ANL/EA/CP-84160
DE95007610	DOE/AL/62350-85-Rev.1	DE95007962	DOE/RL-94-12	DE95008289	ANL/CMT/CP-84163
DE95007611	DOE/AL/62350-174-Rev.1	DE95007967	DOE/RL-94-61-Draft-A	DE95008290	ANL/EA/CP-84360
DE95007612	DOE/AL/62350-176	DE95007968	DOE/RL-94-63-Draft-A	DE95008291	ANL/TD/CP-84268
DE95007613	DOE/AL/62350-166	DE95007970	DOE/MC/29118-95/C0428	DE95008292	ANL/EA/CP-84148
DE95007614	CONF-950268-2	DE95007971	DOE/MC/30173-95/C0414	DE95008301	ANL/EA/CP-85788
DE95007617	CONF-950216-53	DE95007973	DOE/MC/30172-95/C0433	DE95008317	DOE/RL-94-62-Draft-A
DE95007618	CONF-950268-1	DE95007974	DOE/MC/30162-95/C0435	DE95008318	DOE/RL-94-53-Draft-A
DE95007629	ANL/EAD/TM-37	DE95007975	DOE/RL-94-107-Rev.1	DE95008319	DOE/RL-94-67-Draft-A
DE95007633	PNL-10166	DE95007976	DOE/RL-94-107	DE95008331	DOE/OR/22028-T15
DE95007634	PNL-10170-Reissue	DE95007977	DOE/RL-94-104-Draft-A	DE95008362	DOE/MC/29119-95/C0429
DE95007635	PNL-10423	DE95007978	DOE/RL-94-108	DE95008363	DOE/MC/29111-95/C0441
DE95007637	LA-12883-MS	DE95007979	DOE/RL-94-101-Draft-A	DE95008364	DOE/MC/30175-95/C0439
DE95007638	DOE/MC/29113-95/C0437	DE95007980	DOE/RL-94-102-Draft-A	DE95008366	BNL-61450
DE95007641	LA-SUB-95-25	DE95007981	DOE/RL-94-100-Draft-A	DE95008369	UCRL-JC-119133
DE95007642	LA-SUB-95-26	DE95007982	DOE/RL-94-99-Draft-A	DE95008380	UCRL-JC-117153
DE95007643	LA-SUB-95-28	DE95008022	DOE/EA-0339	DE95008385	DOE/MC/30174-95/C0446
DE95007645	LA-SUB-95-30	DE95008025	WHC-SD-WM-SP-008	DE95008408	ANL/ES/CP-85390
DE95007650	WHC-SD-WM-DP-065-Add.1A	DE95008027	WHC-SD-TPWP-001	DE95008409	WHC-SD-WM-RD-052
DE95007651	DOE/ID/12735-T34	DE95008029	WHC-SP-1143	DE95008410	WHC-SD-WM-ES-335
DE95007691	DOE/MC/27346-95/C0430	DE95008030	WHC-SA-2804	DE95008411	WHC-SD-WM-ETP-143
DE95007692	DOE/MC/30179-95/C0440	DE95008031	WHC-SA-2772	DE95008412	WHC-SD-WM-VI-017
DE95007693	DOE/MC/31185-94/C0347	DE95008032	WHC-SA-2782	DE95008413	WHC-SD-WM-TI-685
DE95007694	DOE/MC/30171-95/C0434	DE95008033	WHC-EP-0474-15	DE95008414	WHC-SD-WM-ER-402
DE95007704	DOE/RL-92-63-Rev.2	DE95008034	WHC-EP-0850	DE95008415	WHC-SD-WM-TP-309
DE95007705	DOE/RL-93-74-Draft-A-Vol.1	DE95008035	WHC-SD-SNF-DRP-001	DE95008416	WHC-SD-WM-TP-308
DE95007711	SAND-94-2759	DE95008036	WHC-SD-WM-TRP-227	DE95008417	WHC-SD-WM-TP-312
DE95007721	DOE/MC/30360-95/C0425	DE95008039	WHC-SD-WM-RD-053	DE95008418	WHC-SD-WM-ES-336
DE95007728	SAND-95-0290C	DE95008042	WHC-SD-WM-TI-573-Rev.1	DE95008419	WHC-SD-W059-FDC-002
DE95007729	SAND-94-2266C	DE95008043	WHC-SD-WM-TP-301	DE95008420	WHC-SD-W007H-OTP-001
DE95007730	SAND-94-2348C	DE95008044	WHC-SD-WM-CSDD-015	DE95008421	WHC-SD-W320-TRP-002
DE95007752	PNL-SA-24843	DE95008045	WHC-SD-WM-TP-297	DE95008423	WHC-SD-W302-FDC-001
DE95007756	PNL-SA-24159	DE95008047	WHC-SD-FF-CDR-006	DE95008424	WHC-SD-WM-TRP-225
DE95007759	SAND-94-3012	DE95008048	WHC-SD-WM-TI-677	DE95008425	WHC-SD-WM-DA-168
DE95007760	SAND-94-3123	DE95008084	PNL-10285	DE95008428	WHC-SD-SNF-PLN-004
DE95007772	WHC-EP-0847	DE95008085	PNL-10459	DE95008429	WHC-SD-SNF-DQO-003
DE95007774	WHC-SA-2651	DE95008097	ES/ER/TM-35/R1	DE95008431	WHC-SD-WM-RPT-098
DE95007775	WHC-SA-2625	DE95008106	ORNL/TM-12931	DE95008432	WHC-SD-WM-EE-004-Rev.1
DE95007776	WHC-SA-2613	DE95008152	SAND-94-2387	DE95008433	WHC-SD-ER3297-TS-001-Rev.2
DE95007777	WHC-SA-2628	DE95008153	SAND-94-2128	DE95008451	WHC-SD-EN-DP-071-Rev.1
DE95007778	WHC-SA-2617	DE95008178	DOE/RL-94-145-Draft-B	DE95008457	UCRL-JC-118890
DE95007780	WHC-SA-2639	DE95008179	DOE/RL-95-24	DE95008460	WHC-MR-0492
DE95007782	WHC-SD-FF-ER-102	DE95008180	DOE/RL-94-112-Draft-A	DE95008462	WHC-SD-WM-DA-167
DE95007783	WHC-SD-SNF-TI-010	DE95008181	DOE/RL-94-131-Draft-A	DE95008463	WHC-SD-WM-ER-415
DE95007785	WHC-SD-SNF-DQO-001	DE95008182	DOE/RL-94-113-Draft-A	DE95008464	WHC-SD-WM-DA-165
DE95007786	WHC-SD-EN-AP-165	DE95008183	DOE/RL-94-151	DE95008465	WHC-SD-CP-PLN-027-Rev.1
DE95007787	WHC-SD-W320-TRP-001	DE95008184	DOE/RL-95-27	DE95008466	WHC-SD-GN-QAPP-001-Rev.1
DE95007788	WHC-SD-W320-DA-006	DE95008185	DOE/RL-95-05	DE95008471	WHC-SD-SNF-TP-011
DE95007789	WHC-SD-W236B-DRD-001	DE95008193	DOE/RL-94-103-Vol.1	DE95008472	WHC-SD-SNF-HC-002-Rev.1
DE95007791	WHC-SA-2491	DE95008194	DOE/RL-94-103-Vol.2	DE95008473	WHC-SD-SNF-DQO-002
DE95007792	WHC-SD-WM-ETP-058	DE95008195	DOE/RL-94-103-Vol.3	DE95008474	WHC-SD-SNF-TP-012
DE95007793	WHC-SD-WM-TP-289	DE95008196	DOE/RL-94-103-Vol.4		
DE95007794	WHC-SD-LEF-TS-001-Rev.2	DE95008203	DOE/RL-92-61-Rev.2		
DE95007795	WHC-SA-2729	DE95008205	DOE/RL-94-135-Draft-A		
		DE95008206	DOE/RL-94-132-Draft-A		

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DE95008475	WHC-SD-EN-TI-296	DE95008694	DOE/RL-93-68-Rev.3	DE95009010	DOE/RL-93-80-Draft-A
DE95008476	WHC-SD-WM-PTR-013	DE95008695	DOE/RL-93-81-Draft-A	DE95009011	DOE/RL-94-131
DE95008477	WHC-SD-WM-DA-160	DE95008696	DOE/RL-93-82-Draft-A	DE95009026	CONF-9503120-1
DE95008478	WHC-SD-WM-TP-231-Rev.1	DE95008697	DOE/RL-94-152	DE95009027	CONF-950216-85
DE95008479	WHC-SD-WM-ER-392	DE95008698	DOE/RL-93-80	DE95009041	ORNL/M-4156
DE95008481	WHC-SD-WM-EL-003	DE95008725	DOE/CH/10618-T1	DE95009063	ORNL/TM-12900
DE95008492	PNL-10474	DE95008736	DOE/EM-0228	DE95009067	Y/ER-159/V1
DE95008499	WHC-SD-FF-ER-101	DE95008752	DOE/AL/62350-28	DE95009068	Y/ER-159/V3/Pt.A
DE95008500	WHC-SD-LEF-CSCM-001	DE95008753	DOE/AL/62350-25F	DE95009069	Y/ER-159/V3/Pt.B
DE95008501	LBL-PUB-5353-Rev.1	DE95008754	DOE/AL/62350-23F	DE95009091	WHC-SA-2810
DE95008502	LBL-PUB-5354-Rev.1	DE95008755	DOE/AL/62350-18F	DE95009092	WHC-SD-W236A-PLN-006-Rev.2
DE95008504	DOE/OR-01-1292-D1	DE95008756	DOE/AL/62350-15F	DE95009093	WHC-SD-W211-TI-002
DE95008529	SAND-95-0436C	DE95008757	DOE/AL/62350-12F	DE95009094	WHC-SD-SNF-TRP-004
DE95008530	SAND-95-0437C	DE95008758	DOE/AL/62350-3F	DE95009095	WHC-SD-WM-ATR-094
DE95008532	SAND-95-0289C	DE95008760	DOE/AL/62350-7D-Rev.1	DE95009096	WHC-SD-T100-FDC-001-Rev.1
DE95008547	SAND-95-0344C	DE95008761	DOE/AL/62350-8F	DE95009098	WHC-SD-WM-ETP-137
DE95008548	SAND-95-0195C	DE95008763	DOE/AL/62350-17F	DE95009099	WHC-SD-WM-ML-001
DE95008555	INEL-94/0059	DE95008771	DOE/CH-9504	DE95009100	WHC-SD-WM-TA-160
DE95008556	INEL-94/0203	DE95008781	CONF-941214-4	DE95009101	WHC-SD-CP-SAR-021-Vol.1
DE95008558	INEL-94/0010	DE95008791	WHC-SP-0849	DE95009102	WHC-SD-CP-SAR-021-Vol.2
DE95008560	INEL-94/0105	DE95008792	WHC-EP-0848	DE95009104	WHC-SD-ER3641-OTP-001-Rev.1
DE95008561	INEL-94/0109	DE95008801	WHC-SD-LEF-OTR-001	DE95009105	WHC-SD-WM-CMD-004
DE95008563	INEL-94/0030	DE95008802	WHC-SD-SNF-TRP-003	DE95009114	WHC-SD-W026-SDD-001
DE95008564	INEL-94/0071	DE95008804	WHC-SD-WM-TP-313	DE95009117	FEMP-2370
DE95008566	INEL-94/0252	DE95008805	WHC-SD-SNF-DR-001	DE95009121	PNL-SA-24936
DE95008567	DOE/LLW-204	DE95008806	WHC-SD-SNF-SM-002	DE95009140	WHC-SD-WM-DP-097
DE95008568	DOE/LLW-126	DE95008807	WHC-SD-WM-ATR-112	DE95009141	WHC-SD-WM-VI-018
DE95008569	INEL-94/0159	DE95008814	WHC-SD-534-CSWL-001-Rev.2	DE95009142	WHC-SD-WM-VI-015
DE95008570	DOE/LLW-217	DE95008830	UCRL-JC-118317	DE95009143	WHC-SD-LEF-PLN-001
DE95008571	DOE/LLW-203	DE95008832	WHC-SD-WM-TI-686	DE95009145	WHC-SD-WM-TP-285-Rev.1
DE95008572	INEL-94/0223	DE95008833	WHC-SD-SNF-TI-012	DE95009146	WHC-SD-WM-ETP-115
DE95008574	INEL-94/0210	DE95008834	WHC-SD-WM-CMD-003	DE95009147	WHC-SD-WM-DP-098
DE95008575	INEL-94/0236	DE95008837	WHC-SD-WM-TP-314	DE95009148	WHC-SD-SNF-SD-003-Vol.1
DE95008577	INEL-94/0014	DE95008838	WHC-SD-WM-CMD-002	DE95009150	WHC-SD-WM-PROC-018
DE95008599	INEL-94/0253	DE95008840	CONF-941144-107	DE95009151	WHC-SD-SNF-CMD-001
DE95008601	EGG-ER-11005	DE95008846	CONF-940815-112	DE95009153	WHC-SD-WM-PROC-019
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DE95008606	INEL-94/00045	DE95008871	DOE/OR-2013	DE95009156	WHC-SD-WM-RPT-118
DE95008607	INEL-94/00010	DE95008874	WHC-SD-WM-TP-240	DE95009157	WHC-SD-LEF-QAPP-001
DE95008609	DOE/LLW-163-Vol.1	DE95008875	WHC-SD-SNF-PD-009	DE95009158	WHC-SD-WM-DP-096
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DE95008613	INEL-94/00142	DE95008878	WHC-SD-WM-TP-317	DE95009174	CONF-950216-95
DE95008614	INEL-94/00025	DE95008879	WHC-SD-W059-PSE-002	DE95009364	DOE/EM-0199
DE95008616	INEL-94/00052	DE95008880	WHC-SD-WM-CSRS-007-Rev.2	DE95009376	LBL-36779
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DE95009658	ORNL/GWPO-011	DE95010083	WHC-SD-WM-PROC-014	DE95010229	WHC-SD-WM-ER-394
DE95009662	SAND-94-0844	DE95010084	WHC-SD-WM-QAPP-018-Rev.1	DE95010235	IS-5111
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