OAK RIDGE NATIONAL LABORATORY
TECHNOLOGY LOGIC DIAGRAM

INDEXES

MASTER

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Oak Ridge National Laboratory Technology Logic Diagram

Indexes

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FOREWORD

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. 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 finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk.

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. 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 rankings 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, which are expanded versions of logic paths from Vol. 2.

The focus of this volume is to provide a comprehensive index of ORNL problems, problem area/constituents, remedial technologies, and regulatory terms discussed in the TLD. This supplementary volume consists of three indexes that correspond to the organization of the TLD: Index A for the D&D volumes; Index B for the RA volumes; and Index C for the WM volumes. To facilitate the reader's use, explanatory notes are provided at the front of each index.

The technology evaluations contained in these volumes are based on the best information available during compilation of the TLD. New or more accurate information is solicited to improve the TLD data base. Please send comments to R. L. Fellows, Editor, *Oak Ridge National Laboratory Technology Logic Diagram*, Martin Marietta Energy Systems, Inc., P.O. Box 2003, Oak Ridge, TN 37831-7274. FAX (615-576-8558).

Decontamination and Decommissioning

INDEX A

HOW TO USE THIS INDEX

The Decontamination and Decommissioning (D&D) Index provides a comprehensive list of site problems, problem area/constituents, remedial technologies, and regulatory terms discussed in the D&D sections of the *Oak Ridge National Laboratory Technology Logic Diagram*. All entries provide specific page numbers, or cross-reference entries that provide specific page numbers, in the D&D volumes (Vol. 1, Pt. A; Vol. 2, Pt. A; and appropriate parts of Vol. 3).

Page numbers are located at the end of main entries or at the end of subentries. References to the D&D Vol. 1, Pt. A (*Technology Evaluation*), are indicated by "V1:" and followed by a page number, while references to the D&D Vol. 2, Pt. A (*Technology Logic Diagrams*), are indicated by "V2:" and followed by a specific page number. Specific locations in Vol. 3 (*Technology Evaluation Data Sheets*) are given by the technology code numbers (e.g., roba-45) because pages in this volume are unnumbered.

Cross-references are indicated by a *See* at the end of the main entry. Following the *See* is a list of other main entries, which provide specific page numbers. The exception to this rule is found when any of the "ORNL Problems" are listed as main entries. In this case, a *See* refers to a list of facilities that provides additional information important to the ORNL Problem.

Examples of index entries are provided below.

- A main entry (a specific technology), which consists of a title in bold and a locator. The locator gives specific page numbers—"roba-45" (Vol. 3); "V1: 133, 141" (Vol. 1, Pt. A); and "V2: 119" (Vol. 2, Pt. A):

Technology name	Technology code no.	Vol. no.	Page nos.	Vol. no.	Page no.
↓	↓	↓	↓	↓	↓
Proximity probes , roba-45, V1: 133, 141; V2: 119					
<div style="border: 1px solid black; width: 200px; margin: 0 auto; height: 15px;"></div>					
locator					

- Two main entries that cross-reference. The first example consists of an ORNL Problem and a *See* reference, along with technology names and locators: the second example is the entry referenced, which provides a list of facilities directly related to the first example and a *See* reference to the first example:

Asphalt pavement problem areas, decontamination alternatives for.

For a complete list of facilities, see Asphalt pavement problem areas, facilities associated with

Chemical surface cleaning method technologies
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vacuum cleaning, dcon, V2: 112

Asphalt pavement problem areas, facilities associated with. *For specific technologies to treat these facilities, see Asphalt pavement problem areas, decontamination alternatives for*

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Massive containment problem areas, dismantlement alternatives for

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Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for

Steel containment structure (highly contaminated) problem areas, dismantlement alternatives for

Structural-only concrete problem areas, dismantlement alternatives for

Structural steel problem areas, dismantlement alternatives for

Tank (southeast of Bldg. 7500) problem areas, decontamination alternatives for

Tiled concrete problem areas, decontamination alternatives for

Wood/sheetrock, tar and felt roofing, and concrete problem areas, decontamination alternatives for

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Asbestos problem areas, dismantlement alternatives for

Buried tank problem areas, dismantlement alternatives for

Concrete block and tiled concrete problem areas, decontamination alternatives for

Entombment problem areas, dismantlement alternatives for

General problem areas, characterization alternatives for

Inorganic problem areas, characterization alternatives for

Major equipment removal problem areas, dismantlement alternatives for

Massive containment problem areas, dismantlement alternatives for

Needed enabling technology problem areas, dismantlement alternatives for

Organic problem areas, characterization alternatives for

Painted concrete problem areas, decontamination alternatives for

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Pipe interiors, decontamination alternatives for

Radioactive elements, characterization alternatives for

Reactor pool problem areas, dismantlement alternatives for

Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for

Steel containment structure (highly contaminated) problem areas, dismantlement alternatives for

Structural-only concrete problem areas, dismantlement alternatives for

Structural steel problem areas, dismantlement alternatives for

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Tiled concrete problem areas, decontamination alternatives for

Bldg. 9219-1. For specific technologies to treat this facility, see

Asbestos problem areas, dismantlement alternatives for
Buried tank problem areas, dismantlement alternatives for
Entombment problem areas, dismantlement alternatives for
Major equipment removal problem areas, dismantlement alternatives for
Massive containment problem areas, dismantlement alternatives for
Needed enabling technology problem areas, dismantlement alternatives for
Reactor pool problem areas, dismantlement alternatives for
Steel containment structure (highly contaminated) problem areas, dismantlement alternatives for
Structural-only concrete problem areas, dismantlement alternatives for
Structural steel problem areas, dismantlement alternatives for

Bldg. 9419-1. For specific technologies to treat this facility, see

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General problem areas, characterization alternatives for
Inorganic problem areas, characterization alternatives for
Organic problem areas, characterization alternatives for
Physical problem areas, characterization alternatives for
Pipe interiors, decontamination alternatives for
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Asphalt pavement problem areas, facilities associated with
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Inorganic problem areas, facilities associated with
Major equipment removal problem areas, facilities associated with

Massive containment problem areas, facilities associated with
Needed enabling technology problem areas, facilities associated with
Oil and purex chemical problem areas, facilities associated with
Organic problem areas, facilities associated with
Painted concrete problem areas, facilities associated with
Physical problem areas, facilities associated with
Pipe interiors, facilities associated with
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Homogeneous Reactor Test structure;
membrane between Homogeneous Reactor

Test concrete; Oak Ridge Research Reactor biological shield; Oak Ridge Research Reactor hot cell liners; pavement over 55-gal drum; process piping and tankage; and pulsefeeder pumps

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- Concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for
- Pipe interiors, decontamination alternatives for
- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
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- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for

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Painted concrete problem areas, facilities associated with

Reactor pool problem areas, facilities associated with

Steel containment structure (highly contaminated) problem areas, facilities associated with

Structural-only concrete problem areas, facilities associated with

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 Bldg. 3028 interior/exterior walls—concrete block (fission products, TRU)
 Bldg. 3029 floors—tiled concrete (Cs-137, Sr-90, Co-60, Ir-192)
 Bldg. 3029 interior/exterior walls—concrete block (Cs-137, Sr-90, Co-60, Ir-192)
 Bldg. 3030 floors—tiled concrete (43 beta/gamma emitters)
 Bldg. 3031 floors—tiled concrete (Gd-153, Am-241)
 Bldg. 3031 stacked shielding—concrete block (Gd-153, Am-241)
 Bldg. 3032 floors—tiled concrete (P-32, Am-241)
 Bldg. 3032 interior/exterior walls—concrete block (P-32, Am-241)
 Bldg. 3033 floors—tiled concrete (H-3, Kr-85)
 Bldg. 3036 floors—tiled concrete (Cs-137, Sr-90)
 Bldg. 3036 interior walls—concrete block (Cs-137, Sr-90)
 Bldg. 3038 floors—tiled concrete (Sr-90, Cs-137, Co-60, I-129)
 Bldg. 3038 interior walls—concrete block (Sr-90, Cs-137, Co-60, I-129)
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 Bldg. 3517 interior/exterior walls—concrete block (Cs-137, Sr-90, Co-60)
 Bldg. 7500 floors—tiled concrete (Cs, Sr, TRU, Co-60)
 Bldg. 7500 interior/exterior walls—concrete block (Cs, Sr, TRU, Co-60)
 Bldg. 9201-3 coolant salt cell, floor—tiled concrete (U, Th, coolant salt)
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 Molten Salt Reactor Experiment building floors—tiled concrete (fission products, corrosion products)
 Molten Salt Reactor Experiment building interior/exterior walls—concrete block (fission products, corrosion products)
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 electromigration, dcon-20, V1: 117; V2: 54
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- Bldg. 3029 hot cell interiors—concrete (Cs-137, Sr-90, Co-60, Ir-192)
- Bldg. 3030 hot cell interiors—concrete (43 beta/gamma emitters)
- Bldg. 3031 hot cell interiors—concrete (Gd-153, Am-241)
- Bldg. 3032 hot cell interiors—concrete (P-32, Am-241)
- Bldg. 3036 floor—concrete (Cs-137, Sr-90)
- Bldg. 3038 cell interiors—concrete (Sr-90, Cs-137, Co-60, I-129)
- Bldg. 3517 hot cell interiors—concrete (C-137, Sr-90, Co-60)
- Bldg. 9419-1 floor, first molten salt cells—concrete (U, Th, molten salt)
- Graphite Reactor biological shields—concrete (fission products, Pu, C-14, Fe-55, Cs-137, Sr-90, Co-60, activation products)
- Graphite Reactor canal—concrete (fission products, Pu, C-14, Fe-55, Cs-137, Sr-90, Co-60, activation products)
- Graphite Reactor ductwork—concrete (fission products, Pu, C-14, Fe-55, Cs-137, Sr-90, Co-60, activation products)
- Graphite Reactor stack—concrete (fission products, Pu, C-14, Fe-55, Cs-137, Sr-90, Co-60, activation products)
- Homogeneous Reactor Test structure—high-density concrete (fission products, corrosion products, induced radiation)
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- Pipe interiors, decontamination alternatives for
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- Concrete block and tiled concrete problem areas,
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- Concrete problem areas, decontamination
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- Painted concrete problem areas, decontamination
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- Pipe interiors, decontamination alternatives for
- Stainless steel, steel plate, sheet steel,
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- Tank (southeast of Bldg. 7500) problem areas,
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Encasement—subsurface waste storage with void reduction (entombment), dism-113, V1: 80; V2: 37

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End effectors/alternatives, roba-23, V1: 132, 140; V2: 117

Energy dispersive X-ray spectroscopy, char-35, V1: 49; V2: 13

Engineered storage—for very “hot” items, future disposal (entombment), dism-115, V1: 80; V2: 38

Entombment problem areas, dismantlement alternatives for. *For a complete list of facilities, see* Entombment problem areas, facilities associated with

Entombment technologies

- capping—above ground environmental barrier (entombment), dism-112, V1: 80; V2: 37
- concrete-based solidification/stabilization , dism-120, V2: 39
- encasement—subsurface waste storage with void reduction (entombment), dism-113, V1: 80; V2: 37
- engineered storage—for very “hot” items, future disposal (entombment), dism-115, V1: 80; V2: 38
- ground-water diversion (entombment), dism-110, V2: 36
- hydraulic isolation (entombment), dism-116, V2: 38
- modular entombment—with provisions for future removal (entombment), dism-119, V2: 39
- permanent entombment (entombment), dism-114, V1: 80; V2: 38
- rubbilization via crushing and/or shredding (entombment), dism-117, V2: 39
- sensors for monitoring entombment integrity (entombment), dism-118, V1: 80; V2: 39
- temporary entombment/clay fill (entombment), dism-111, V2: 37
- thermoset polymer/thermal plastic stabilization (entombment), dism-109, V2: 36

Entombment problem areas, facilities associated with. *For specific technologies to treat these facilities, see* Entombment problem areas, dismantlement alternatives for

Bldgs. 3028, 3028E, 3029, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 7500, 9219-1, 9201-3, and 9419-1; drain lines; Homogeneous Reactor Test structure; membrane between Homogeneous Reactor Test concrete; Oak Ridge Research Reactor biological shield; Oak Ridge Research Reactor hot cell liners; pavement over 55-gal drum; process piping and tankage; and pulsefeeder pumps

Equipment removal. *See*

Major equipment removal problem areas, decontamination alternatives for

Explosive, dcon-48, V1: 118; V2: 49, 58, 74, 84, 109

Explosive cutting (buried tanks), dism-33, V1: 79; V2: 25

Explosive cutting (major equipment removal), dism-96, V2: 34

Explosive cutting (reactor pools), dism-23, V2: 24

Explosive cutting (steel structures, highly contaminated), dism-62, V1: 79; V2: 30

Explosive cutting (structural-only concrete), dism-45, V2: 27

Explosive cutting (structural steel, mild contaminants), dism-78, V2: 31

External duct/pipe crawlers, roba-6, V1: 131, 139; V2: 115

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Facilities. *For complete lists of facilities and associated problem areas, see*

Asbestos problem areas, facilities associated with
Asphalt pavement problem areas, facilities associated with

Buried tank problem areas, facilities associated with

Concrete block and tiled concrete problem areas, facilities associated with

Concrete problem areas, facilities associated with
Entombment problem areas, facilities associated with

General problem areas, facilities associated with
Inorganic problem areas, facilities associated with

Isotope facilities scheduled for D&D program

Major equipment removal problem areas, facilities associated with

Massive containment problem areas, facilities associated with

Needed enabling technology problem areas, facilities associated with

ORNL facilities already in D&D program

ORNL special-case facilities

Oil and purex chemical problem areas, facilities associated with

Organic problem areas, facilities associated with
Painted concrete problem areas, facilities associated with

Physical problem areas, facilities associated with
Pipe interiors, facilities associated with

PCBs, facilities associated with

Radioactive constituents, facilities associated with

Reactor pool problem areas, facilities associated with

Reactors and support facilities, robotics and automation alternatives for

Stainless steel, steel plate, sheet steel, and structural steel problem areas, list of facilities associated with

Steel containment structure (highly contaminated) problem areas, facilities associated with

Storage buildings, robotics and automation alternatives for

Structural-only concrete problem areas, facilities associated with

Structural steel problem areas, facilities associated with

Tiled concrete problem areas, facilities associated with

Wood/sheetrock, tar and felt roofing, and concrete problem areas, facilities associated with

Zincalloy, steel, and aluminum piping problem areas, facilities associated with

Facilities scheduled for decontamination and decommissioning. *See*

Isotope facilities scheduled for D&D program

ORNL facilities already in D&D program

ORNL special-case facilities

Failure recovery systems for mobile platforms, roba-11, V1: 131, 139; V2: 115

Fe-55. *For specific technologies to treat this contaminant, see*

Concrete problem areas, decontamination alternatives for

Fiber-optic chemical sensors, char-25, V1: 45, 51; V2: 5, 18

Fiber-optic systems for measuring multiple physical variables, char-248, V1: 51; V2: 17

Field hardening, roba-53, V1: 133, 141; V2: 120

Fission products. *For specific technologies to treat these contaminants, see*

Asphalt pavement problem areas, decontamination alternatives for

Concrete block and tiled concrete problem areas, decontamination alternatives for

Concrete problem areas, decontamination alternatives for

Oil and purex chemical problem areas, characterization alternatives for

Painted concrete problem areas, decontamination alternatives for

Pipe interiors, decontamination alternatives for
Stainless steel, steel plate, sheet steel,

and structural steel problem areas, decontamination alternatives for

Tank (southeast of Bldg. 7500) problem areas, decontamination alternatives for

Tiled concrete problem areas, decontamination alternatives for

Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for

Zincalloy, steel, and aluminum piping problem areas, decontamination alternatives for

Flashlamp cleaning, dcon-77, V1: 119; V2: 50, 59, 64, 75, 89

Flashlamp heating to release or desorb surface and subsurface contaminants, char-87, V1: 45; V2: 4

Floodplains, wetlands and, V1: 167, 168

Fluoboric acid treatment, dcon-11, V1: 117; V2: 53, 60, 69, 78, 94, 102

Fluorescence diagnosis of contaminated surfaces, char-110, V1: 50; V2: 14

Force limiting/compliant mechanisms, roba-26, V1: 132, 140; V2: 117

Force/torque, roba-50, V1: 133, 141; V2: 119

Force/torque sensors, roba-46, V1: 133, 141; V2: 119

Fourier transform infrared spectroscopy, char-8, V1: 46; V2: 6

Fractals used to select models for material transport in porous media, char-225, V1: 47; V2: 10

Fugitive dust emissions. See
Clean Air Act

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Gd-153. For specific technologies to treat this contaminant, see

- Concrete block and tiled concrete problem areas, decontamination alternatives for
- Concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for
- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
- Tiled concrete problem areas, decontamination alternatives for
- Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for

Gamma-ray spectrometry, char-268, V1: 49; V2: 12

Gas chromatography, char-94, V1: 51, 52; V2: 16, 19

Gas chromatography—Fourier transform infrared spectroscopy, char-66, V1: 50; V2: 16

Gas chromatography in the field, char-262, V1: 50, 51; V2: 15

Gas chromatography—mass spectrometry, char-88, V1: 50, 52; V2: 16, 18

Gas phase decontamination, dcon-16, V1: 117; V2: 95

General gripper/tool interface, roba-25, V1: 132, 140; V2: 117

Generalized object-oriented simulation software (needed enabling technologies), dism-173, V1: 48; V2: 43

General problem areas, characterization alternatives for. For a complete list of facilities, see General problem areas, facilities associated with

Data analysis/management technologies

analysis of censored data, char-249, V1: 47; V2: 9

application of approximate reasoning to data analysis/evaluation, char-234, V1: 46; V2: 8

automated scanning and conversion of engineering drawings (needed enabling technologies), dism-155, V1: 47, 81; V2: 8

client/server access to standards and regulatory guidelines (needed enabling technologies), dism-153, V1: 47, 81; V2: 7

client/server architecture for data base access (needed enabling technologies), dism-157, V1: 47; V2: 9

computer-aided task analysis and procedure preparation (needed enabling technologies), dism-172, V1: 47, 81; V2: 8

computer-based training systems (needed enabling technologies), dism-191, V1: 47, 81; V2: 8

criticality indices, char-44, V1: 47; V2: 9

data access services (needed enabling technologies), dism-154, V1: 47; V2: 7

fractals used to select models for material transport in porous media, char-225, V1: 47; V2: 10

geographic information system for DOE sites (needed enabling technologies), dism-181, V1: 47; V2: 8

hazard analysis expert system, char-233, V1: 46; V2: 8

hypertext information systems (needed enabling technologies), dism-158, V1: 48; V2: 9

modeling of volatile organic compounds migration in porous materials, char-53, V1: 47; V2: 9

network architecture with integrated workstations, char-221, V1: 46; V2: 7

project information access services (needed enabling technologies), dism, 151, V2: 7

quality control for measurement processes, char-250, V1: 47; V2: 9

simulated walkthrough facility for robotics task sequence analysis (needed enabling technologies), dism-171, V1: 47, 81; V2: 8

spatial sample and data analysis plans, char-253, V1: 46; V2: 9

statistical methods for the analysis of large data sets, char-251, V1: 47; V2: 9

- task-scheduling aids, char-241, V1: 47; V2: 9
- 3-D CAD data base of buildings and structures (needed enabling technologies), dism-156, V1: 48, 81; V2: 10
- Detection/measurement—field method technologies
 - air monitoring, char-59, V1: 46; V2: 5
 - electrochemical methods, char-10, V1: 46; V2: 6
 - fiber-optic chemical sensors, char-25, V1: 45, 51; V2: 5
 - infrared spectroscopy (wavelength dispersion), char-18, V1: 46, 51; V2: 5
 - immunoassay detection, char-23, V1: 46; V2: 5
 - ion mobility mass spectrometry, char-264, V1: 45; V2: 5
 - laser photo acoustic spectroscopy, char-15, V1: 46, 51, 52; V2: 6
 - optical absorption spectroscopy, char-27, V1: 46; V2: 5
 - personnel monitoring, char-52, V1: 46; V2: 5
 - portable luminescence detection, char-92, V1: 46; V2: 6
 - portable Raman spectrometer, char-84, V1: 46; V2: 5
- Detection/measurement—laboratory method technologies
 - contamination control—analytical equipment, char-204, V1: 46; V2: 6
 - electrochemical methods, char-10, V1: 46; V2: 7
 - Fourier transform infrared spectroscopy, char-8, V1: 46; V2: 6
 - isotopic dilution mass spectrometry, char-48, V1: 46; V2: 6
 - laser ionization mass spectrometry, char-4, V1: 46; V2: 7
 - nuclear magnetic resonance, char-11, V1: 46; V2: 6
 - secondary ion mass spectroscopy, char-3, V1: 46; V2: 6
 - ultraviolet/visible spectroscopy, char-9, V1: 46; V2: 7
- Sample collection technologies
 - flashlamp heating to release or desorb surface and subsurface contaminants, char-87, V1: 45; V2: 4
 - in situ solvent extraction, char-62, V1: 45; V2: 3
 - laser ablation for sample collection, char-86, V1: 45; V2: 4
 - membranes for sample collection and concentration, char-55, V2: 3
 - metallographic sectioning and preparation, char-67, V1: 45; V2: 3
 - multiangle drilling for depth profiling of contaminants, char-64, V1: 45; V2: 3
 - punch cores, char-82, V1: 45; V2: 3
 - sampling and mixing methods, char-81, V1: 45; V2: 3
 - sampling interface system for surface contamination by organics, char-271, V1: 45; V2: 4
 - ultrasonic extraction, char-20, V1: 45; V2: 3
- Sample preparation technologies
 - adaptation of the EPA toxicity characteristic leaching process for use with radioactive samples, char-209, V1: 45; V2: 4
 - high-pressure ashing for sample preparation, char-203, V1: 45; V2: 4
 - microwave digestion, char-19, V1: 45; V2: 4
 - radioactive sample preparation, char-205, V1: 45; V2: 4
 - supercritical fluid extraction of inorganics, char-201, V1: 45; V2: 4
 - supercritical fluid extraction of organics, char-208, V1: 45; V2: 4
- Sampling design technologies
 - optimization of sampling designs, char-71, V1: 45; V2: 3
 - sampling program configuration management system, char-228, V1: 45; V2: 3
 - sequential sampling plans, char-252, V1: 45; V2: 3
- General problem areas, facilities associated with.**
For specific technologies to treat these facilities, see
 General problem areas, characterization alternatives for
 - Bldgs. 3028, 3029, 3029E, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 9201-3, and 9419-1; drain lines; pulsefeeder pumps; pavement over 55-gal drum; and process piping and tankage
- Generic BRC levels for radioactive wastes.** *See*
 Below regulatory concern levels, generic, for radioactive waste
- Geographic information system for DOE sites (needed enabling technologies),** dism-181, V1: 47; V2: 8, 43
- GIF images to augment as-built documentation (needed enabling technologies),** dism-145, V2: 41
- Classification (asbestos),** dism-86, V2: 32
- Glow discharge ionization mass spectroscopy,** char-56, V1: 50; V2: 14
- Graphite Reactor.** *See*
 - Concrete problem areas, decontamination alternatives for
 - Painted concrete problem areas, decontamination alternatives for
 - Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
- Grappler/gross shearing and lifting (major equipment removal),** dism-103, V2: 36

Grappler mobile shearing (steel structures, highly contaminated), dism-61, V1: 79; V2: 30

Grappler mobile shearing (structural steel, mild contaminants), dism-77, V1: 80; V2: 31

Grappler (structural-only concrete), dism-48, V1: 79; V2: 27

Grit blasting, dcon-38, V1: 118; V2: 47, 56, 61, 72, 82, 107

Ground-water diversion (entombment), dism-110, V2: 36

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Hand brushing used to remove surface contamination, dcon-56, V1: 118; V2: 52, 65, 77, 110

Hand grinding, honing, scraping, dcon-43, V1: 118; V2: 48, 57, 62, 73, 83, 108

Hazard analysis expert system, char-233, V1: 46; V2: 8

Hazardous debris. See
Resource Conservation and Recovery Act

High-pressure abrasive water jet (buried tanks), dism-31, V1: 79; V2: 25

High-pressure abrasive water jet (major equipment removal), dism-97, V2: 34

High-pressure abrasive water jet (massive containment), dism-11, V1: 79; V2: 23

High-pressure abrasive water jet (reactor pools), dism-21, V1: 79; V2: 23

High-pressure abrasive water jet (structural-only concrete), dism-41, V1: 79; V2: 26

High-pressure ashing for sample preparation, char-203, V1: 45; V2: 4

High-pressure water, dcon-52, V1: 118; V2: 51, 64, 76, 110

High-pressure water jet (major equipment removal), dism-93, V1: 80; V2: 33

Historic and archaeological resources, V1: 170, 171

Holographic imaging, char-46, V1: 51; V2: 17

Homogeneous Reactor Test structure. See
Asbestos problem areas, dismantlement alternatives for

Buried tank problem areas, dismantlement alternatives for

Concrete problem areas, decontamination alternatives for

Entombment problem areas, dismantlement alternatives for

Major equipment removal problem areas, dismantlement alternatives for

Massive containment problem areas, dismantlement alternatives for

Needed enabling technology problem areas, dismantlement alternatives for

Pipe interiors, decontamination alternatives for
Reactor pool problem areas, dismantlement alternatives for

Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for

Steel containment structure (highly contaminated) problem areas, dismantlement alternatives for

Structural-only concrete problem areas, dismantlement alternatives for

Structural steel problem areas, dismantlement alternatives for

Zincoalloy, steel, and aluminum piping problem areas, decontamination alternatives for

Hot cell problem areas. See

Abandoned hot cells, robotics and automation alternatives for

Asbestos problem areas, dismantlement alternatives for

Buried tank problem areas, dismantlement alternatives for

Concrete problem areas, decontamination alternatives for

Entombment problem areas, dismantlement alternatives for

Major equipment removal problem areas, dismantlement alternatives for

Massive containment problem areas, dismantlement alternatives for

Needed enabling technology problem areas, dismantlement alternatives for

Painted concrete problem areas, decontamination alternatives for

Reactor pool problem areas, dismantlement alternatives for

Stabilized hot cells, robotics and automation alternatives for

Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for

Steel containment structure (highly contaminated) problem areas, dismantlement alternatives for

Structural-only concrete problem areas, dismantlement alternatives for

Structural steel problem areas, dismantlement alternatives for

Hydraulic isolation (entombment), dism-116, V2: 38

H-S. For specific technologies to treat this contaminant, see

- Concrete block and tiled concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for
- Pipe interiors, decontamination alternatives for
- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
- Tiled concrete problem areas, decontamination alternatives for
- Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for

Hypertext information systems (needed enabling technologies), dism-158, V1: 48; V2: 9, 43

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Ice blasting, dcon-40, V1: 118; V2: 48, 57, 61, 73, 87, 107

Immunoassay detection, char-23, V1: 46; V2: 5

Incineration, dcon-2, V1: 117; V2: 80, 85

Inductively coupled plasma—mass spectroscopy, char-78, V1: 49; V2: 13

Inductively coupled plasma spectroscopy, char-77, V1: 49; V2: 13

Information management for sample handling, roba-56, V1: 133, 141; V2: 120

Infrared absorption (laser-based source), char-85, V1: 50, 51; V2: 14, 18

Infrared spectroscopy (wavelength dispersion), char-18, V1: 46, 51; V2: 5, 18

Inorganic acid treatments, dcon-12, V1: 117; V2: 69, 94, 102

Inorganic cementitious matrix composites model, char-39, V1: 51; V2: 17

Inorganic problem areas, characterization alternatives for. For a complete list of facilities, see Inorganic problem areas, facilities associated with

Field method technologies

- atomic emission spectroscopy, char-76, V1: 49; V2: 12
- laser ablation; inductively coupled plasma; atomic emission spectroscopy, char-111, V1: 49; V2: 13
- portable X-ray fluorescence, char-6, V1: 49; V2: 13
- X-ray fluorescence for in situ monitoring of toxic heavy metals, char-219, V1: 49; V2: 13

Laboratory method technologies

- atomic emission spectroscopy, char-76, V1: 49; V2: 13
- auger electron spectroscopy, char-2, V1: 50; V2: 14
- cold vapor (mercury) analysis, char-24, V1: 49; V2: 14
- electron diffraction, char-37, V1: 49; V2: 13
- electron spectroscopy for chemical analysis, char-1, V1: 50; V2: 14
- energy dispersive X-ray spectroscopy, char-35, V1: 49; V2: 13
- glow discharge ionization mass spectroscopy, char-56, V1: 50; V2: 14
- inductively coupled plasma—mass spectroscopy, char-78, V1: 49; V2: 13
- inductively coupled plasma spectroscopy, char-77, V1: 49; V2: 13
- ion chromatography, char-50, V1: 49; V2: 13
- neutron activation analysis, char-266, V1: 48, 49; V2: 14
- particle-induced X-ray emission, char-17, V1: 49; V2: 14
- powder X-ray diffraction, char-31, V1: 50; V2: 14
- scanning electron microscopy, char-33, V1: 49; V2: 14
- transmission electron microscopy, char-34, V1: 49; V2: 13
- wavelength dispersive X-ray spectroscopy, char-36, V1: 49; V2: 13

Inorganic problem areas, facilities associated with. For specific technologies to treat these facilities, see Inorganic problem areas, characterization alternatives for

- Bldgs. 3028, 3029, 3029E, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 9201-3, and 9419-1; drain lines; pulsefeeder pumps; pavement over 55-gal drum; and process piping and tankage

In situ solvent extraction, char-62, V1: 45; V2: 3

Instrument response models for remote sensing, char-246, V1: 51; V2: 17

Integrated automated analytical laboratory, roba-55, V1: 133, 141; V2: 120

Internal duct/pipe crawler, roba-5, V1: 131, 139; V2: 115

I-129. For specific technologies to treat this contaminant, see

- Concrete block and tiled concrete problem areas, decontamination alternatives for
- Concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for

I-129 *(continued)*

- Tiled concrete problem areas, decontamination alternatives for
- Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for

Ion chromatography, char-50, V1: 49; V2: 13

Ion mobility mass spectrometry, char-264, V1: 45; V2: 5

Ir-192. *For specific technologies to treat this contaminant, see*

- Concrete block and tiled concrete problem areas, decontamination alternatives for
- Concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for
- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
- Tiled concrete problem areas, decontamination alternatives for
- Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for

Iron. *See*
Fe-55

Isotope facilities scheduled for D&D program, V1: 12, 14

Isotopic dilution mass spectrometry, char-48, V1: 46; V2: 6

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Kr-85. *For specific technologies to treat this contaminant, see*

- Concrete block and tiled concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for
- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
- Tiled concrete problem areas, decontamination alternatives for
- Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for

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Land disposal restrictions. *See*
Resource Conservation and Recovery Act

Laser ablation for sample collection, char-86, V1: 45; V2: 4

Laser ablation; inductively coupled plasma; atomic emission spectroscopy, char-111, V1: 49; V2: 13

Laser ablation organic mass spectrometry, char-93, V1: 51, 52; V2: 16, 19

Laser cutting (asbestos), dism-84, V1: 80; V2: 32

Laser cutting (major equipment removal), dism-91, V2: 33

Laser cutting (steel structures, highly contaminated), dism-51, V2: 28

Laser cutting (structural steel, mild contaminants), dism-71, V1: 80; V2: 30

Laser etching and ablation, dcon-74, V1: 119; V2: 50, 59, 63, 75, 88, 98, 109

Laser heating, dcon-73, V1: 119; V2: 50, 59, 63, 75, 88, 98

Laser ionization mass spectrometry, char-4, V1: 46; V2: 7

Laser photo acoustic spectroscopy, char-15, V1: 46, 51, 52; V2: 6

Laser triangular mapping of facilities (needed enabling technologies), dism-146, V2: 41

Leach/electrowinning, dcon-34, V1: 117; V2: 68, 93, 102, 105

Liquid chromatography—mass spectrometry, char-89, V1: 50, 52; V2: 16

Liquid scintillation counting, char-267, V1: 49; V2: 12

Liquified cryogenic gas cutting (major equipment removal), dism-101, V2: 35

Location-specific regulations, V1: 168

Long-arm deployed robotic platforms, roba-9, V1: 131, 139; V2: 115

Long-range alpha detector, char-65, V1: 48; V2: 10

Long-reach manipulator (heavy duty), roba-15, V1: 131, 139; V2: 116

Long-reach manipulator (light duty), roba-14, V1: 131, 139; V2: 116

Low-Intensity Test Reactor. *See*
Concrete problem areas, decontamination alternatives for
Zircalloy, steel, and aluminum piping problem areas, decontamination alternatives for

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Magnetic resonance imaging, char-58, V1: 51;
V2: 17

Major equipment removal problem areas, dismantlement alternatives for. *For a complete list of facilities, see Major equipment removal problem areas, facilities associated with*

- Automated conventional technologies
 - grappler/gross shearing and lifting (major equipment removal), dism-103, V2: 36
- Conventional technologies
 - conventional disassembly (major equipment removal), dism-102, V2: 36
- Cutting technologies
 - advanced automated fixtures, bug-o, et. (major equipment removal), dism-100, V1: 80; V2: 35
 - advanced laser cutting (major equipment removal), dism-95, V1: 80; V2: 34
 - diamond wire cutting (major equipment removal), dism-94, V2: 34
 - explosive cutting (major equipment removal), dism-96, V2: 34
 - high-pressure abrasive water jet (major equipment removal), dism-97, V2: 34
 - high-pressure water jet (major equipment removal), dism-93, V1: 80; V2: 33
 - laser cutting (major equipment removal), dism-91, V2: 33
 - liquified cryogenic gas cutting (major equipment removal), dism-101, V2: 35
 - mechanical saws (major equipment removal), dism-90, V1: 80; V2: 33
 - plasma arc cutting (major equipment removal), dism-92, V1: 80; V2: 33
 - plasma arc saw cutting (major equipment removal), dism-98, V2: 35
 - thermal arc water jet cutting (major equipment removal), dism-99, V2: 35
- Demolition technologies
 - oxyacetylene (major equipment removal), dism-89, V2: 33
 - thermite cutting (major equipment removal), dism-88, V2: 32

Major equipment removal problem areas, facilities associated with. *For specific technologies to treat these facilities, see Major equipment removal problem areas, dismantlement alternatives for*

- Bldgs. 3028, 3028E, 3029, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 7500, 9219-1, 9201-5, and 9419-1; drain lines; Homogeneous Reactor Test structure; membrane between Homogeneous Reactor Test concrete; Oak Ridge Research Reactor biological shield; Oak Ridge Research Reactor hot cell liners; pavement over 55-gal drum; process piping and tankage; and pulsefeeder pumps

Manipulation (Cartesian control), roba-31, V1: 132, 140; V2: 117

Manipulation (joint control), roba-30, V1: 132, 140; V2: 117

Manipulation (redundancy control), roba-33, V1: 132, 140; V2: 118

Manipulation (special purpose control), roba-32, V1: 132, 140; V2: 118

Massive containment problem areas, dismantlement alternatives for. *For a complete list of facilities, see Massive containment problem areas, facilities associated with*

- Cutting technologies
 - diamond wire cutting (massive containment), dism-12, V1: 79; V2: 23
 - high-pressure abrasive water jet (massive containment), dism-11, V1: 79; V2: 23
- Demolition technologies
 - microwave demolition (massive containment), dism-16, V1: 79; V2: 23

Massive containment problem areas, facilities associated with. *For specific technologies to treat these facilities, see Massive containment problem areas, dismantlement alternatives for*

- Bldgs. 3028, 3028E, 3029, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 7500, 9219-1, 9201-3, and 9419-1; drain lines; Homogeneous Reactor Test structure; membrane between Homogeneous Reactor Test concrete; Oak Ridge Research Reactor biological shield; Oak Ridge Research Reactor hot cell liners; pavement over 55-gal drum; process piping and tankage; and pulsefeeder pumps

Mechanical saws (major equipment removal), dism-90, V1: 80; V2: 33

Membranes for sample collection and concentration, char-55, V2: 3

Metallographic sectioning and preparation, char-67, V1: 45; V2: 3

Metal milling, dcon-45, V1: 118; V2: 62

Microwave demolition (buried tanks), dism-38, V2: 26

Microwave demolition (massive containment), dism-16, V1: 79; V2: 23

Microwave demolition (reactor pools), dism-28, V1: 79; V2: 25

Microwave demolition (structural-only concrete), dism-47, V2: 27

Microwave digestion, char-19, V1: 45; V2: 4

Microwave scabbling, dcon-71, V1: 119; V2: 49, 58, 74

Modeling of heterogeneous materials sampling, char-61, V1: 51; V2: 17

Modeling of volatile organic compounds migration in porous materials, char-53, V1: 47; V2: 9

Modular entombment—with provisions for future removal (entombment), dism-119, V2:

Molten salt. *For specific technologies to treat this contaminant, see*

- Concrete block and tiled concrete problem areas, decontamination alternatives for
- Concrete problem areas, decontamination alternatives for
- Painted concrete problem areas, decontamination alternatives for
- Pipe interiors, decontamination alternatives for
- Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
- Tiled concrete problem areas, decontamination alternatives for
- Wood/sheetrock, tar and felt, and concrete problem areas, decontamination alternatives for 39

Mounted robotic platforms, roba-8, V1: 131, 139; V2: 115

Multiangle drilling for depth profiling of contaminants, char-64, V1: 45; V2: 3

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National Emission Standards for Hazardous Air Pollutants. *See*
Clean Air Act

National Emission Standards for Hazardous Air Pollutants for asbestos. *See*
Clean Air Act

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Needed enabling technology problem areas, dismantlement alternatives for. *For a complete list of facilities, see* Needed enabling technology problem areas, facilities associated with

Needed enabling technologies

- automated engineering system life cycle planning (needed enabling technologies), dism-174, V1: 48; V2: 43
- automated scanning and conversion of engineering drawings (needed enabling technologies), dism-155, V1: 47, 81; V2: 42

- automated system reliability and safety analysis (needed enabling technologies), dism-175, V1: 48; V2: 43
- bar code/laser tooling location (needed enabling technologies), dism-140, V2: 40
- client/server access to standards and regulatory guidelines (needed enabling technologies), dism-153, V1: 47, 81; V2: 42
- client/server architecture for data base access (needed enabling technologies), dism-157, V1: 47; V2: 42
- computer-aided task analysis and procedure preparation (needed enabling technologies), dism-172, V1: 47, 81; V2: 43
- computer-based D&D information retrieval (needed enabling technologies), dism-143, V1: 81; V2: 40
- computer-based training systems (needed enabling technologies), dism-191, V1: 47, 81; V2: 44
- data access services (needed enabling technologies), dism-154, V1: 47; V2: 42
- electronic catalog descriptions and source locations of site historical data (needed enabling technologies), dism-159, V1: 81; V2: 43
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- geographic information system for DOE sites (needed enabling technologies), dism-181, V1: 47; V2: 43
- GIF images to augment as-built documentation (needed enabling technologies), dism-145, V2: 41
- hypertext information systems (needed enabling technologies), dism-158, V1: 48; V2: 43
- laser triangular mapping of facilities (needed enabling technologies), dism-146, V2: 41
- network architecture with integrated workstations (needed enabling technologies), dism-152, V2: 42
- point-and-direct tooling positioning (needed enabling technologies), dism-142, V2: 40
- project information access services (needed enabling technologies), dism-151, V1: 47, 81; V2: 42
- 3-D CAD data base of buildings and structures (needed enabling technologies), dism-156, V1: 48, 81; V2: 42
- video mapping (needed enabling technologies), dism-147, V2: 41
- zoning for containment—three zones (needed enabling technologies), dism-141, V2: 40

Needed enabling technology problem areas, facilities associated with. *For specific technologies to treat these facilities, see Needed enabling technology problem areas, dismantlement alternatives for*

Bldgs. 3028, 3028E, 3029, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 7500, 9219-1, 9201-3, and 9419-1; drain lines; Homogeneous Reactor Test structure; membrane between Homogeneous Reactor Test concrete; Oak Ridge Research Reactor biological shield; Oak Ridge Research Reactor hot cell liners; pavement over 55-gal drum; process piping and tankage; and pulsefeeder pumps

NESHAPs for asbestos. *See*

National Emission Standards for Hazardous Air Pollutants for asbestos

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Neutron activation, char-107, V1: 48; V2: 11

Neutron activation analysis, char-266, V1: 48, 49; V2: 12, 14

Nondestructive testing for concrete, char-38, V1: 51; V2: 17

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Oak Ridge Research Reactor facility. *See*

Asbestos problem areas, dismantlement alternatives for
Buried tank problem areas, dismantlement alternatives for
Concrete block and tiled concrete problem areas, decontamination alternatives for
Concrete problem areas, decontamination alternatives for
Entombment problem areas, dismantlement alternatives for
Major equipment removal problem areas, dismantlement alternatives for
Massive containment problem areas, dismantlement alternatives for
Needed enabling technology problem areas, dismantlement alternatives for
Painted concrete problem areas, decontamination alternatives for
Pipe interiors, decontamination alternatives for
Reactor pool problem areas, dismantlement alternatives for

Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for
Steel containment structure (highly contaminated) problem areas, dismantlement alternatives for
Structural-only concrete problem areas, dismantlement alternatives for
Structural steel problem areas, dismantlement alternatives for
Tiled concrete problem areas, decontamination alternatives for
Wood/sheetrock, tar and felt roofing, and concrete problem areas, decontamination alternatives for

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General industry requirements, V1: 172
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Oil and purex chemical problem areas, characterization alternatives for. *For a complete list of facilities, see Oil and purex chemical problem areas, facilities associated with*

Field method technologies

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fiber-optic chemical sensors, char-25, V1: 45, 51; V2: 18
gas chromatography—mass spectrometry, char-88, V1: 50, 52; V2: 18
infrared absorption (laser-based source), char-85, V2: 18
infrared spectroscopy (wavelength dispersion), char-18, V1: 46, 51; V2: 18
portable volatile organic compound detectors, char-5, V1: 50, 51; V2: 18
sampling interface system for surface contamination by organics, char-271, V1: 45; V2: 18

Laboratory method technologies

analytical methods for chelators and decontamination agents, char-206, V1: 50, 52; V2: 19
laser ablation organic mass spectrometry, char-93, V1: 51, 52; V2: 19
on-line supercritical fluid extraction—multidetector gas chromatography, char-115, V1: 50, 52; V2: 19

Oil and purex chemical problem areas, facilities associated with. *For specific technologies to treat these facilities, see Oil and purex chemical problem areas, characterization alternatives for*

Painted sheet metal floor of coolant salt cell, Bldg. 9203-1; 3,000-gal stainless steel tank, Bldg. 9203-1; Fission Products Development Laboratory inactive cells, Bldg. 3019

On-line supercritical fluid extraction—multidetector gas chromatography, char-115, V1: 50, 52; V2: 16, 19

Operator interface (command input), roba-40, V1: 132, 140; V2: 118

Operator interface (operator assistance), roba-41, V1: 132, 140; V2: 119

Operator interface (status/alert system), roba-42, V1: 132, 140; V2: 119

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Optimization of sampling designs, char-71, V1: 45; V2: 3

Organic acid treatments, dcon-10, V1: 117; V2: 69, 93, 102

Organic problem areas, characterization alternatives for. *For a complete list of facilities, see Organic problem areas, facilities associated with*

Field method technologies

direct sampling ion trap mass spectrometry, char-90, V1: 50-52; V2: 15

fluorescence diagnosis of contaminated surfaces, char-110, V1: 50; V2: 14

gas chromatography in the field, char-262, V1: 50, 51; V2: 15

infrared absorption (laser-based source), char-85, V1: 50, 51; V2: 14

portable gas chromatograph/electron capture detection for analyzing PCBs, char-100, V1: 50, 52; V2: 15

portable volatile organic compound detectors, char-5, V1: 50, 51; V2: 15

synchronous fluorescence screening for polycyclic aromatic hydrocarbons, char-101, V1: 50; V2: 15

Laboratory method technologies

analytical methods for chelators and decontamination agents, char-206, V1: 50, 52; V2: 15

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gas chromatography—mass spectrometry, char-88, V1: 50, 52; V2: 16

laser ablation organic mass spectrometry, char-93, V1: 51, 52; V2: 16

liquid chromatography—mass spectrometry, char-89, V1: 50, 52; V2: 16

on-line supercritical fluid extraction—multidetector gas chromatography, char-115, V1: 50, 52; V2: 16

surface-enhanced Raman scattering, char-265, V1: 51; V2: 16
synchronous fluorescence screening for polycyclic aromatic hydrocarbons, char-101, V1: 50; V2: 16

Organic problem areas, facilities associated with. *For specific technologies to treat these facilities, see Organic problem areas, characterization alternatives for*

Bldgs. 3028, 3029, 3029E, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 9201-3, and 9419-1; drain lines, pulsefeeder pumps; pavement over 55-gal drum; and process piping and tankage

ORNL facilities already in D&D program, V1: 6-12

ORNL special-case facilities, V1: 14

OSHA. *See*

Occupational, Safety, and Health Act

Oxyacetylene (major equipment removal), dism-89, V2: 33

Oxygen cutting (steel structures, highly contaminated), dism-57, V1: 79; V2: 29

Oxygen cutting (structural steel, mild contaminants), dism-75, V1: 80; V2: 31

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Painted concrete problem areas, decontamination alternatives for. *For a complete list of facilities, see Painted concrete problem areas, facilities associated with*

Chemical surface cleaning method technologies
chelation treatment, dcon-21, V1: 117; V2: 60

fluoboric acid treatment, dcon-11, V1: 117; V2: 60

Mechanical surface removal method technologies
automated grinding, dcon-44, V1: 118; V2: 57

centrifuge cryogenic CO₂ pellet blasting, dcon-39, V1: 118; V2: 39

concrete milling, dcon-47, V1: 118; V2: 58

explosive, dcon-48, V1: 118; V2: 58

grit blasting, dcon-38, V1: 118; V2: 56

hand grinding, honing, scraping, dcon-43, V1: 118; V2: 57

ice blasting, dcon-40, V1: 118; V2: 57

plastic pellet blasting, dcon-42, V1: 118; V2: 57

scabblers/scarifiers, dcon-37, V1: 117; V2: 56

shot blasting, dcon-36, V1: 117; V2: 56

supercritical CO₂ blasting, dcon-41, V1: 118; V2: 57

ultrahigh-pressure water, dcon-35, V1: 117; V2: 56

Surface cleaning method technologies
compressed-air cryogenic CO₂ pellet blasting,
dcon-51, V1: 118; V2: 60

Thermal surface removal method technologies
flashlamp cleaning, dcon-77, V1: 119; V2: 59
laser etching and ablation, dcon-74, V1: 119;
V2: 59
laser heating, dcon-73, V1: 119; V2: 59
microwave scabbling, dcon-71, V1: 119;
V2: 58
plasma torch, dcon-72, V1: 119; V2: 59

Painted concrete problem areas, facilities associated with. *For specific technologies to treat these facilities, see Painted concrete problem areas, decontamination alternatives for*

Bldg. 3019 hot cell interiors, floors, and cell faces—painted concrete (U-233, Pu-239, fission products)
Bldg. 3028 hot cell interiors, floors, cell faces—painted concrete (fission products, Cm-147, Pm-241, Am)
Bldg. 3029 cell faces—painted concrete (Cs-137, Sr-90, Co-60, Ir-192)
Bldg. 3030 floors and cell faces—painted concrete (43 beta/gamma emitters)
Bldg. 3031 floors and cell faces—painted concrete (Gd-153, Am-241)
Bldg. 3032 floors and cell faces—painted concrete (P-32, Am-241)
Bldg. 3033 cell faces—painted concrete (H-3, Kr-85)
Bldg. 3036 floors—painted concrete (Cs-137, Sr-90)
Bldg. 3038 cell floor and surfaces—painted concrete (Sr-90, Cs-137, Co-60, I-129)
Bldg. 3047 floors and cell faces—painted concrete (Cs, Sr, Co, Cm, Eu, Am, Pu)
Bldg. 3505 floors and cell faces—painted concrete (fission products, TRU)
Bldg. 3506 hot cell interiors—painted concrete (fission products)
Bldg. 3515 floors and cell faces—painted concrete (fission products)
Bldg. 3517 high-bay floors and cell faces—painted concrete (Cs-137, Sr-90, Co-60)
Bldg. 7852 floors and cell faces—painted concrete (fission products, corrosion products, Cs, Sr, TRU, Co, Cm, Eu, Am, Pu)
Bldg. 9201-3 coolant salt cell—painted concrete (U, Th, coolant salt)
Bldg. 9201-3 molten salt cell—painted concrete (U, Th, molten salt)
Graphite Reactor biological shield exterior—painted concrete (fission products, Pu, C-14, F3-55, Cs-137, Sr-90, Co-60, activation products)
Oak Ridge Research Reactor hot cell interiors, floors, cell faces—painted concrete (fission products, TRU)

Particle-induced X-ray emission, char-17, V1: 49; V2: 14

Particle size analysis, char-26, V1: 51; V2: 17

Passive monitors for weak beta radionuclides, char-102, V1: 48; V2: 10

Pavement problem areas. *See*
Asphalt pavement problem areas,
decontamination alternatives for

PCB immunoassay kit, char-99, V2: 19

Permanent entombment (entombment), dism-114, V1: 80; V2: 38

Personnel monitoring, char-52, V1: 46; V2: 5

P-32. *For specific technologies to treat this contaminant, see*

Concrete block and tiled concrete problem areas,
decontamination alternatives for
Concrete problem areas, decontamination
alternatives for
Painted concrete problem areas, decontamination
alternatives for
Stainless steel, steel plate, sheet steel,
and structural steel problem areas,
decontamination alternatives for
Tiled concrete problem areas, decontamination
alternatives for
Wood/sheetrock, tar and felt, and concrete
problem areas, decontamination
alternatives for

Photon electron rejecting alpha liquid scintillation, char-97, V1: 49; V2: 12

Physical problem areas, characterization alternatives for. *For a complete list of facilities, see*
Physical problem areas, facilities associated with
Field method technologies

fiber-optic systems for measuring multiple
physical variables, char-248, V1: 51;
V2: 17

instrument response models for remote
sensing, char-246, V1: 51; V2: 17

Laboratory method technologies
holographic imaging, char-46, V1: 51; V2: 17
inorganic cementitious matrix composites
model, char-39, V1: 51; V2: 17
magnetic resonance imaging, char-58,
V1: 51; V2: 17
modeling of heterogeneous materials sampling,
char-61, V1: 51; V2: 17
nondestructive testing for concrete, char-38,
V1: 51; V2: 17
optical microscopy, char-32, V1: 51; V2: 17
particle size analysis, char-26, V1: 51; V2: 17
radiation-induced segregation model,
char-42, V1: 51; V2: 18

Physical problem areas, facilities associated with.
For specific technologies to treat these facilities, see
Physical problem areas, characterization alternatives
for

Bldgs. 3028, 3029, 3029E, 3030, 3031, 3032,
3033, 3036, 3038, 3517, 9201-3,
and 9419-1; drain lines, pulsefeeder
pumps; pavement over 55-gal drum; and
process piping and tankage

Pipe interiors, decontamination alternatives for.
For a complete list of facilities, see Pipe interiors,
facilities associated with

Chemical surface cleaning technologies
chelation treatment, dcon-21, V1: 117;
V2: 96
chemical foams, dcon-8, V1: 117; V2: 93
detergent treatment, dcon-13, V1: 117;
V2: 94
electropolishing, dcon-15, V1: 117; V2: 95
fluoboric acid treatment, dcon-11, V1: 117;
V2: 94
gas phase decontamination, dcon-16,
V1: 117; V2: 95
inorganic acid treatments, dcon-12, V1: 117;
V2: 94
organic acid treatments, dcon-10, V1: 117;
V2: 93
REDOX treatments, dcon-14, V1: 117; V2: 95
Mechanical surface removal method technologies
automated grinding, dcon-44, V1: 118;
V2: 88
centrifuge cryogenic CO₂ pellet blasting,
dcon-39, V1: 118; V2: 87
ice blasting, dcon-40, V1: 118; V2: 87
plastic pellet blasting, dcon-42, V1: 118;
V2: 88
supercritical CO₂ blasting, dcon-41, V1: 118;
V2: 87
ultrahigh-pressure water, dcon-35, V1: 117;
V2: 87

Metal refining method technologies
electrorefining, dcon-32, V1: 117; V2: 92
leach/electrowinning, dcon-34, V1: 117;
V2: 93
smelt purification, dcon-31, V1: 117; V2: 92

Surface cleaning method technologies
automated brushing, dcon-57, V1: 118;
V2: 91
compressed-air cryogenic CO₂ pellet blasting,
dcon-51, V1: 118; V2: 90
dry heat (bulk roasting), dcon-4, V1: 117;
V2: 91
solvent washing to remove radiological
contamination, dcon-61, V1: 118; V2: 91
steam cleaning, dcon-55, V1: 118; V2: 90
superheated water, dcon-53, V1: 118; V2: 90
vacuum cleaning, dcon-64, V1: 118; V2: 91
water flushing, dcon-54, V1: 118; V2: 90
ultrasonic cleaning, dcon-65, V1: 118; V2: 92

Thermal surface removal method technologies
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laser etching and ablation, dcon-74, V1: 119;
V2: 88
laser heating, dcon-73, V1: 119; V2: 88

plasma etching/fluorination, dcon-76,
V1: 119; V2: 89
plasma surface cleaning, dcon-75, V1: 119;
V2: 89

Pipe interiors, facilities associated with. *For
specific technologies to treat these facilities, see* Pipe
interiors, decontamination alternatives for

Bldg. 3517 process piping
and tankage—stainless steel pipe interior
(Cs-137, Sr-90)
Drain lines from Bldg. 9419-1—steel pipe interior
(U, Th, molten salt)
Drain lines from coolant salt cell, Bldg.
9201-3—steel pipe interior (U, Th, coolant
salt)
Drain lines from molten salt cells, Bldg.
9201-3—steel pipe interior (U, Th, molten
salt)
Homogeneous Reactor Test process
piping—stainless steel pipe interior
(UO₂SO₄, fission products, corrosion
products)
Instrument air lines and air lines in coolant salt
cell, Bldg. 9201-3—copper tubing interior
(U, Th, H-3, molten salt)
Molten Salt Reactor Experiment Off-Gas
System—steel pipe interior
Molten Salt Reactor Experiment reactor
piping—INOR piping interior (U, Be, L, F,
TF₂)
Oak Ridge Research Reactor demineralizer piping
(outside pool)—stainless steel pipe interior
(fission products, corrosion products)
Oak Ridge Research Reactor primary coolant
piping—aluminum piping interior (fission
products, corrosion products)
Pulse-feeder pumps—metal (heavy water)

Plasma arc cutting (major equipment removal),
dism-92, V1: 80; V2: 33

**Plasma arc cutting (steel structures, highly
contaminated),** dism-56, V1: 79; V2: 28

**Plasma arc cutting (structural steel, mild
contaminants),** dism-74, V1: 80; V2: 31

**Plasma arc saw cutting (major equipment
removal),** dism-98, V2: 35

**Plasma arc saw (steel structures, highly
contaminated),** dism-58, V2: 29

Plasma etching/fluorination, dcon-76, V1: 119;
V2: 89

Plasma surface cleaning, dcon-75, V1: 119; V2: 63,
89

Plasma torch, dcon-72, V1: 119; V2: 50, 59, 63, 75

Plastic pellet blasting, dcon-42, V1: 118; V2: 48,
57, 62, 73, 88, 97, 108

Plate, steel. See

Stainless steel, steel plate, and structural steel problem areas, decontamination alternatives for

Pu. For specific technologies to treat this contaminant, see

Concrete problem areas, decontamination alternatives for
Painted concrete problem areas, decontamination alternatives for
Stainless steel, steel plate, sheet steel, and structural steel problem areas, decontamination alternatives for

Point-and-direct tooling positioning (needed enabling technologies), *dism-142, V2: 40*

Polychlorinated biphenyls (PCBs)

Characterization alternatives for. *For a complete list of facilities, see Polychlorinated biphenyls (PCBs), facilities associated with Field method technologies*

direct sampling ion trap mass spectrometry, *char-90, V1: 50-52; V2: 19*
PCB immunoassay kit, *char-99, V2: 19*
portable gas chromatograph/electron capture detection for analyzing PCBs, *char-100, V1: 50, 52; V2: 19*
sampling interface system for surface contamination by organics, *char-271, V1: 45; V2: 19*

Laboratory method technologies

gas chromatography, *char-94, V1: 51, 52; V2: 19*
on-line supercritical fluid extraction—multidetector gas chromatography, *char-115, V1: 50, 52; V2: 19*

Polychlorinated biphenyls (PCBs), facilities associated with. *For specific technologies to treat these facilities, see PCBs, characterization alternatives for*

Asbestos pipe insulation, *Bldg. 9201-3*

Pool. See

Reactor pool problem areas, dismantlement alternatives for

Portable gamma-ray scintillometers, *char-263, V1: 48; V2: 11*

Portable gas chromatograph/electron capture detection for analyzing PCBs, *char-100, V1: 50, 52; V2: 15, 19*

Portable luminescence detection, *char-92, V1: 46; V2: 6*

Portable Raman spectrometer, *char-84, V1: 46; V2: 5*

Portable volatile organic compound detectors, *char-5, V1: 50, 51; V2: 15, 18*

Portable X-ray fluorescence, *char-6, V1: 49; V2: 13*

Position/velocity sensors, *roba-48, V1: 133, 141; V2: 119*

Powder X-ray diffraction, *char-31, V1: 50; V2: 14*

Power sources for mobile platforms, *roba-10, V1: 131, 139; V2: 115*

Precise programmable motions, *roba-20, V1: 131, 140; V2: 116*

Process emissions. See
Clean Air Act

Project information access services (needed enabling technologies), *dism-151, V: 47, 81; V2: 7, 42*

Pm-147. For specific technologies to treat this contaminant, see

Concrete problem areas, decontamination alternatives for

Proportional counter for alpha and beta activity, *char-108, V1: 48, 49; V2: 10, 12*

Proximity probes, *roba-45, V1: 133, 141; V2: 119*

Proximity probes as sensors, *roba-51, V1: 133, 141; V2: 119*

Punch cores, *char-82, V1: 45; V2: 3*

Purex. See

Oil and purex chemical problem areas, characterization alternatives for

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Quality control for measurement processes, *char-250, V1: 47; V2: 9*

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Radiation hardening, *roba-54, V1: 133, 141; V2: 120*

Radiation-induced segregation model, *char-42, V1: 51; V2: 18*

Radiation Protection Standards

DOE orders, *V1: 173-175*
Generic BRC levels for radioactive wastes, *V1: 175-176*

Radioactive elements, characterization alternatives for. *For a complete list of facilities, see* Radioactive elements, facilities associated with

Field method technologies

- advanced radiation monitors, char-269, V1: 48; V2: 11
- alpha track etch detectors for surface alpha contamination, char-96, V1: 48; V2: 11
- bubble dosimeters for neutron flux, char-216, V1: 48; V2: 11
- electret passive surface alpha monitor, char-95, V1: 48; V2: 11
- long-range alpha detector, char-65, V1: 48; V2: 10
- passive monitors for weak beta radionuclides, char-102, V1: 48; V2: 10
- portable gamma-ray scintillometers, char-263, V1: 48; V2: 11
- proportional counter for alpha and beta activity, char-108, V1: 48, 49; V2: 10
- thermoluminescence dosimeter array for spatial characterization of surface alpha contamination, char-103, V1: 48; V2: 10
- tritium/beta/gamma floor scanner, char-105, V1: 48; V2: 11

Laboratory method technologies

- gamma-ray spectrometry, char-268, V1: 49; V2: 12
- liquid scintillation counting, char-267, V1: 49; V2: 12
- neutron activation, char-107, V1: 48; V2: 11
- neutron activation analysis, char-266, V1: 48; V2: 12
- photon electron rejecting alpha liquid scintillation, char-97, V1: 49; V2: 12
- proportional counter for alpha and beta activity, char-108, V1: 48, 49; V2: 12
- radioanalytical procedures, char-202, V1: 49; V2: 12
- radiographic imaging, char-40, V1: 49; V2: 12
- sodium iodide-germanium gamma spectroscopy, char-106, V1: 48; V2: 12

Radioactive elements, facilities associated with. *For specific technologies to treat these facilities, see* Radioactive elements, characterization alternatives for

- Bldgs. 3028, 3029, 3029E, 3030, 3031, 3032, 3033, 3036, 3038, 3517, 9201-3, and 9419-1; drain lines, pulsefeeder pumps; pavement over 55-gal drum; and process piping and tankage

Radioactive sample preparation, char-205, V1: 45; V2: 4

Radioactive wastes, generic BRC levels for. *See* Radiation Protection Standards

Radioanalytical procedures, char-202, V1: 49; V2: 12

Radiographic imaging, char-40, V1: 49; V2: 12

Range finders, roba-44, V1: 133, 140; V2: 119

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- Descriptions of criteria, V1: 30-32
- for characterization technologies, V1: 45-52; V2: 3-19
- for decontamination technologies, V1: 117-119; V2: 47-112
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RCRA. See

Resource Conservation and Recovery Act

Reactor pool problem areas, dismantlement alternatives for. *For a complete list of facilities, see*

Reactor pool problem areas, facilities associated with

Cutting technologies

- diamond wire cutting (reactor pools), dism-22, V2: 24
- explosive cutting (reactor pools), dism-23, V2: 24
- high-pressure abrasive water jet (reactor pools), dism-21, V1: 79; V2: 23

Demolition technologies

- conventional demolition (reactor pools), dism-26, V2: 24
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Bldg. 3029 exterior walls—sheet steel (Cs-137, Sr-90, Co-60, Ir-192)

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Bldg. 3517 hot cell liners—stainless steel (Cs-137, Sr-90, Co-60)

Bldg. 3517 interior/exterior walls—stainless steel (Cs-137, Sr-90, Co-60)

Bldg. 7500 high-bay area—sheet steel (Cs, Sr, TRU, Co-60)

Bldg. 9201-3 three walls and upper floors of molten salt cells—sheet steel (U, Th, molten salt)

Bldg. 9201-3 walls and roof of coolant salt cells—sheet steel (U, Th, coolant salt)

Bldg. 9419-1 handrail—painted steel pipe exterior (U, Th, molten salt)

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Molten Salt Reactor Experiment exterior siding—sheet steel (Cs, Sr, TRU, Co-60)

Molten Salt Reactor Experiment off-gas system—stainless steel pipe exterior (fission products, corrosion products)

Molten Salt Reactor Experiment piping—INOR-8 pipe exterior (U, Be, LiF, TlF₃)

Oak Ridge Research Reactor building siding—sheet steel (fission products)

Oak Ridge Research Reactor demineralizer piping (outside pool)—stainless steel pipe exterior (fission products, corrosion products)

Oak Ridge Research Reactor hot cell liners—stainless steel (fission products, corrosion products)

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Remedial Action

INDEX B

HOW TO USE THIS INDEX

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Page numbers are located at the end of main entries or at the end of subentries. References to the RA Vol. 1, Pt. B (*Technology Evaluation*), are indicated by "V1:" and followed by a page number, while references to the RA Vol. 2, Pt. B (*Technology Logic Diagrams*), are indicated by "V2:" and followed by a specific page number. Specific locations in Vol. 3 (*Technology Evaluation Data Sheets*) are given by the technology code numbers (e.g., rema-41) because pages in this volume are unnumbered.

Cross-references are indicated by a *See* at the end of the main entry. Following the *See* is a list of other main entries, which provide specific page numbers.

Examples of index entries are provided below.

- A main entry (a specific technology), which consists of a title in bold and a locator. The locator gives specific page numbers—"rema-41" (Vol. 3); "V1: 95, 100" (Vol. 1, Pt. B); and "V2: 24, 41" (Vol. 2, Pt. B):

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<div style="border: 1px solid black; width: 200px; margin: 0 auto; height: 15px;"></div>					
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- Two main entries that cross-reference. The first example consists of an ORNL Problem and a *See* reference; the second example is the entry referenced, which provides specific page numbers:

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 - position/velocity sensors, roba-48, V1: 116, 123; V2: 55
 - proximity probes as control sensors, roba-51, V1: 116, 123; V2: 55
 - tooling sensors, roba-52, V1: 116, 123; V2: 55
- Sensors—perception technologies
 - force/torque sensors, roba-46, V1: 116, 123; V2: 55

- proximity probes, roba-45, V1: 116, 123; V2: 54
- range finders, roba-44, V1: 116, 123; V2: 54
- visual/aural, roba-43, V1: 116, 123; V2: 54

Buried waste

- Description of implementation needs for remedial action alternatives, V1: 90
- Description of remedial action alternatives for, V1: 78
- Description of science and technology needs for remedial action alternatives, V1: 86
- Problem definition, V1: 14

Buried waste (buried bulk equipment items), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Excavation technologies
 - bulk item exhumation, rema-126, V1: 95-96; V2: 32

Buried waste (composition determination), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Field method technologies
 - electromagnetic offset log survey, char-272, V2: 19
 - fiber-optic chemical sensors, char-25, V1: 65; V2: 19
 - hydrofracture ground-water monitoring, char-274, V1: 65; V2: 19
 - SEAMIST inverted membrane, char-273, V1: 65; V2: 19
- Sample collection technologies
 - SEAMIST inverted membrane, char-273, V1: 65; V2: 19

Buried waste (general problem areas), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Data analysis management technologies
 - analysis of censored data, char-249, V1: 61; V2: 10
 - application of approximate reasoning to data analysis/evaluation, char-234, V1: 61; V2: 9
 - automated scanning and conversion of engineering drawings, dism-155, V1: 61; V2: 9
 - client/server access to standards and regulatory guidelines, dism-153, V1: 61; V2: 8
 - client/server architecture for data base access, dism-157, V1: 61; V2: 9
 - computer-aided task analysis and procedure preparation, dism-172, V1: 61; V2: 9
 - computer-based training systems, dism-191, V1: 61; V2: 9
 - configuration management system, char-229, V1: 62; V2: 11
 - criticality indices, char-44, V1: 61; V2: 10
 - data access services, dism-154, V1: 61; V2: 8
 - detection and measurement systems with feature extraction, char-223, V1: 62; V2: 11

- dynamic modeling of material transport, char-255, V1: 62; V2: 11
- fractals used to select models for material transport in porous media, char-225, V1: 62; V2: 11
- geographic information system for DOE sites, dism-181, V1: 61; V2: 8
- hazard analysis expert system, char-233, V1: 61; V2: 9
- hypertext information systems, dism-158, V1: 61; V2: 10
- modeling of volatile organic compounds migration in porous materials, char-53, V1: 61; V2: 10
- multisensor fusion measurement systems, char-222, V1: 62; V2: 11
- network architecture with integrated workstations, char-221, V2: 8
- project information access services, dism-151, V1: 61; V2: 8
- quality control for measurement processes, char-250, V1: 61; V2: 10
- simulated walkthrough facility for robotics task sequence analysis, dism-171, V1: 61; V2: 9
- spatial sample and data analysis, char-253, V1: 61; V2: 10
- statistical methods for the analysis of large data sets, char-251, V1: 61; V2: 10
- stored material neural net identification system, char-242, V1: 62; V2: 11
- subsurface complexation model, char-45, V1: 62; V2: 11
- task scheduling aids, char-241, V1: 61; V2: 10
- Detection/measurement—field method technologies
 - air monitoring, char-59, V1: 60; V2: 6
 - electrical and electromagnetic detection of ground and geologic features, char-125, V1: 60; V2: 6
 - electrochemical methods, char-10, V1: 60; V2: 7
 - fiber-optic chemical sensors, char-25, V1: 65, V1: 59; V2: 5
 - ground-penetrating radar, char-124, V1: 60; V2: 6
 - immunoassay detection, char-23, V1: 60, V1: 60; V2: 5
 - infrared spectroscopy (wavelength dispersion), char-18, V1: 60; V2: 6
 - ion mobility mass spectrometry, char-264, V1: 59; V2: 5
 - magnetics, char-128, V1: 60; V2: 6
 - microgravity methods, char-127, V1: 60; V2: 6
 - optical absorption spectroscopy, char-27, V1: 60; V2: 5
 - personnel monitoring, char-52, V1: 60; V2: 6
 - portable luminescence detection, char-92, V1: 60; V2: 7
 - portable Raman spectrometer, char-84, V1: 60; V2: 5
 - seismic methods (retraction, profiling, reflection), char-126, V1: 60; V2: 6
 - tomographic seismic monitoring, char-60, V1: 60; V2: 6
 - ultrasonic ranging and data system, char-123, V1: 60; V2: 6
- Detection/measurement—laboratory method technologies
 - contamination control—analytical equipment, char-204, V1: 60; V2: 7
 - Fourier transform infrared spectroscopy, char-8, V1: 60; V2: 7
 - isotopic dilution mass spectroscopy, char-48, V1: 60; V2: 7
 - laser ionization mass spectrometry, char-4, V1: 61; V2: 8
 - nuclear magnetic resonance, char-11, V1: 60; V2: 7
 - secondary ion mass spectroscopy, char-3, V1: 60; V2: 7
 - ultraviolet/visible spectroscopy, char-9, V1: 60; V2: 8
- Sample collection technologies
 - in situ solid phase microextraction of organics, char-210, V1: 59; V2: 3
 - membranes for sample collection and concentration, char-55, V1: 59; V2: 4
 - multiangle drilling for depth profiling of contaminants, char-64, V1: 59; V2: 4
 - sampling and mixing methods, char-81, V1: 59; V2: 3
 - sampling of heterogeneous wastes, char-270, V1: 59; V2: 4
 - sampling USTs for volatile organics, char-257, V1: 59; V2: 3
 - SEAMIST inverted membrane, char-273, V1: 65; V2: 19
 - sediment sampling from restricted access locations, char-276, V1: 59; V2: 4
 - soil/sediment sampling for volatile organics analysis, char-256, V1: 59; V2: 3
 - solid sorbent sampling in airborne organics, char-254, V1: 59; V2: 3
- Sample preparation technologies
 - adaptation of the EPA TCLP leaching test for use with radioactive samples, char-209, V1: 59; V2: 4
 - high-pressure ashing, char-203, V1: 59; V2: 5
 - metallographic sectioning and preparation, char-67, V1: 59; V2: 4
 - microwave digestion, char-19, V1: 59; V2: 4
 - radioactive sample preparation, char-205, V1: 59; V2: 4
 - supercritical fluid extraction of inorganics, char-201, V1: 59; V2: 5
 - supercritical fluid extraction of organics, char-208, V1: 59; V2: 4
- Sampling design technologies
 - optimization of sampling designs, char-71, V1: 59; V2: 3
 - sampling program configuration management system, char-228, V1: 59; V2: 3
 - sequential sampling plans, char-252, V1: 59; V2: 3

Buried waste (HFIR control plates), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Excavation technologies
 - overshot drilling, rema-123, V1: 96; V2: 32
 - wireline basket recovery, rema-125, V1: 96; V2: 32

Buried waste (high-specific activity europium in HFIR, TRU oxides, and concentrated low-level waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Conversion technologies
 - transmutation, rema-127, V1: 97; V2: 29

Buried waste (inorganics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Field method technologies
 - atomic emission spectroscopy, char-76, V1: 63; V2: 14
 - portable X-ray fluorescence, char-6, V1: 63; V2: 14
 - X-ray fluorescence for in situ monitoring of toxic heavy metals, char-219, V1: 63; V2: 14
- Laboratory method technologies
 - atomic emission spectroscopy, char-76, V1: 63; V2: 15
 - auger electron spectroscopy, char-2, V1: 64; V2: 16
 - cold vapor (mercury) analysis, char-24, V1: 64; V2: 15
 - electron diffraction, char-37, V1: 63; V2: 15
 - electron spectroscopy for chemical analysis, char-1, V1: 64; V2: 16
 - energy dispersive X-ray spectroscopy, char-35, V1: 63; V2: 15
 - glow discharge ionization mass spectroscopy, char-56, V1: 63; V2: 16
 - inductively coupled plasma—mass spectroscopy, char-78, V1: 63; V2: 14
 - inductively coupled plasma spectroscopy, char-77, V1: 63; V2: 14
 - ion chromatography, char-50, V1: 63; V2: 15
 - neutron activation analysis, char-266, V1: 63-64; V2: 14
 - particle-induced X-ray emission, char-17, V1: 63; V2: 15
 - powder X-ray diffraction, char-31, V1: 64; V2: 16
 - scanning electron microscopy, char-33, V1: 63; V2: 15
 - transmission electron microscopy, char-34, V1: 63; V2: 15
 - wavelength dispersive X-ray spectroscopy, char-36, V1: 63; V2: 15

Buried waste (low-level waste), remedial action alternatives, in WAGs 1, 3, 4, 5, 6, and 7 for

- Bottom seal technologies
 - jet grouting, rema-85, V1: 95; V2: 26
 - microtunneled high-density polyethylene, rema-86, V1: 95; V2: 26
 - vibrated plastic tube bottom seal, rema-87, V1: 95; V2: 26

Capping technologies

- capping, rema-46, V1: 95; V2: 24
- intruder barriers, rema-94, V2: 24

Destruction technologies

- calcining/sintering, rema-98, V1: 97; V2: 27
- in situ vitrification (buried waste), rema-100, V1: 96; V2: 29
- vitrification, rema-117, V1: 97; V2: 29

Excavation technologies

- borehole mining, rema-4, V1: 96; V2: 31
- modular excavation, rema-122, V1: 96; V2: 32
- precision excavation, rema-90, V1: 96; V2: 31
- remote excavation, rema-38, V1: 96; V2: 31
- solidify and mine (freeze and mine), rema-10, V1: 96; V2: 32
- vacuum loader (buried waste), rema-101, V1: 96; V2: 33

Fixation technologies

- cementitious solidification, rema-9, V1: 97; V2: 28
- ceramic encapsulation, rema-116, V1: 97; V2: 29
- in situ chemical grouting, rema-2, V1: 96; V2: 28
- in situ particulate grouting, rema-3, V1: 96; V2: 27
- in situ vitrification (buried waste), rema-100, V1: 96; V2: 29
- polymer-impregnated concrete/polymer modified concrete, rema-115, V1: 97; V2: 29
- sulfur polymer cement, rema-114, V1: 97; V2: 28
- thermoplastic encapsulation, rema-112, V1: 97; V2: 28
- thermoset encapsulation, rema-113, V1: 97; V2: 28
- vitrification, rema-117, V1: 97; V2: 29

Physical separation

- freeze separation, rema-91, V1: 96; V2: 31
- gravity sorting, rema-8, V1: 96; V2: 31
- physical sorting, rema-121, V1: 96; V2: 30
- shredding and magnetic separation, rema-93, V1: 96; V2: 30
- soil washing, rema-6, V2: 30

Wall technologies

- hydromill, rema-84, V1: 95; V2: 25
- slurry wall with high-density polyethylene insert, rema-83, V1: 95; V2: 24

Buried waste (metals), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Barrier technologies

- cryogenic barriers, rema-58, V1: 95; V2: 25
- grout curtains, rema-42, V1: 95; V2: 24
- sheet pile walls, rema-41, V1: 95; V2: 24
- soil saw, rema-88, V1: 95; V2: 25

Bottom seal technologies

- jet grouting, rema-85, V1: 95; V2: 26
- microtunneled high-density polyethylene, rema-86, V1: 95; V2: 26
- vibrated plastic tube bottom seal, rema-87, V1: 95; V2: 26

Capping technologies

capping, rema-46, V1: 95; V2: 24
intruder barriers, rema-94, V2: 24

Destruction technologies

calcining/sintering, rema-98, V1: 97; V2: 27
in situ vitrification (buried waste), rema-100,
V1: 96; V2: 29
vitrification, rema-117, V1: 97; V2: 29

Drain technologies

biopolymer drains, rema-44, V1: 95; V2: 25
french drains, rema-43, V1: 95; V2: 25
horizontal wells, rema-45, V1: 95; V2: 25

Excavation technologies

borehole mining, rema-4, V1: 96; V2: 31
modular excavation, rema-122, V1: 96;
V2: 32
precision excavation, rema-90, V1: 96; V2: 31
remote excavation, rema-38, V1: 96; V2: 31
solidify and mine (freeze and mine), rema-10,
V1: 96; V2: 32
vacuum loader (buried waste), rema-101,
V1: 96; V2: 33

Fixation technologies

cementitious solidification, rema-9, V1: 97;
V2: 28
ceramic encapsulation, rema-116, V1: 97;
V2: 29
in situ chemical grouting, rema-2, V1: 96;
V2: 28
in situ particulate grouting, rema-3, V1: 96;
V2: 27
in situ vitrification (buried waste), rema-100,
V1: 96; V2: 29
polymer-impregnated concrete/polymer
modified concrete, rema-115, V1: 97; V2: 29
sulfur polymer cement, rema-114, V1: 97;
V2: 28
thermoplastic encapsulation, rema-112,
V1: 97; V2: 28
thermoset encapsulation, rema-113, V1: 97;
V2: 28
vitrification, rema-117, V1: 97; V2: 29

Physical separation

freeze purification, rema-91, V1: 96; V2: 31
gravity sorting, rema-8, V1: 96; V2: 31
physical sorting, rema-121, V1: 96; V2: 30
shredding and magnetic separation, rema-93,
V1: 96; V2: 30
soil washing, rema-6, V2: 30

Recovery technologies

smelting, wpro-111, V1: 97; V2: 30

Wall technologies

cryogenic barriers, rema-58, V1: 95; V2: 25
hydromill, rema-84, V1: 95; V2: 25
slurry wall with high-density polyethylene
insert, rema-83, V1: 95; V2: 24
soil saw, rema-88, V1: 95; V2: 25

Buried waste (mixed waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Bottom seal technologies

jet grouting, rema-85, V1: 95; V2: 26
microtunneled high-density polyethylene,
rema-86, V1: 95; V2: 26

vibrated plastic tube bottom seal, rema-87,
V1: 95; V2: 26

Capping technologies

capping, rema-46, V1: 95; V2: 24
intruder barriers, rema-94, V2: 24

Destruction technologies

calcining/sintering, rema-98, V1: 97; V2: 27

Excavation technologies

borehole mining, rema-4, V1: 96; V2: 31
modular excavation, rema-122, V1: 96;
V2: 32
precision excavation, rema-90, V1: 96; V2: 31
remote excavation, rema-38, V1: 96; V2: 31
solidify and mine (freeze and mine), rema-10,
V1: 96; V2: 32
vacuum loader (buried waste), rema-101,
V1: 96; V2: 33

Fixation technologies

cementitious solidification, rema-9, V1: 97;
V2: 28
ceramic encapsulation, rema-116, V1: 97;
V2: 29
in situ chemical grouting, rema-2, V1: 96;
V2: 28
in situ particulate grouting, rema-3, V1: 96;
V2: 27
in situ vitrification (buried waste), rema-100,
V1: 96; V2: 29
polymer-impregnated concrete/polymer
modified concrete, rema-115, V1: 97;
V2: 29
sulfur polymer cement, rema-114, V1: 97;
V2: 28
thermoplastic encapsulation, rema-112,
V1: 97; V2: 28
thermoset encapsulation, rema-113, V1: 97;
V2: 28
vitrification, rema-117, V1: 97; V2: 29

Physical separation

freeze purification, rema-91, V1: 96; V2: 31
thermal desorption, rema-92, V1: 96; V2: 30

Wall technologies

hydromill, rema-84, V1: 95; V2: 25
slurry wall with high-density polyethylene
insert, rema-83, V1: 95; V2: 24

Buried waste (organics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Field method technologies

direct sampling ion trap mass spectrometry,
char-90, V1: 64; V2: 16
gas chromatography in the field, char-262,
V1: 64; V2: 17
PCB immunoassay kit, char-99, V2: 16
portable gas chromatograph/electron capture
detector for analyzing PCBs, char-100,
V1: 64; V2: 16
portable volatile organic compounds
detectors, char-5, V1: 64; V2: 16
synchronous fluorescence screening for
polycyclic aromatic hydrocarbons,
char-101, V1: 64; V2: 17

Buried waste (organics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7 (continued)

Laboratory method technologies

- analytical methods for chelators and decontamination agents, char-206, V1: 64; V2: 17
- capillary zone electrophoresis, char-207, V1: 64; V2: 17
- gas chromatography, char-94, V1: 64; V2: 18
- gas chromatography—Fourier transform infrared spectroscopy, char-66, V1: 64; V2: 17
- gas chromatography—mass spectroscopy, char-88, V1: 64; V2: 18
- liquid chromatography—mass spectroscopy, char-89, V1: 64; V2: 17
- on-line supercritical fluid extraction—multidetector gas chromatography, char-115, V1: 64; V2: 17
- solid phase microextraction analytical method, char-211, V1: 65; V2: 18
- synchronous fluorescence screening for polycyclic aromatic hydrocarbons, char-101, V1: 64; V2: 18

Buried waste (organics), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Barrier technologies

- cryogenic barriers, rema-58, V1: 95; V2: 25
- grout curtains, rema-42, V1: 95; V2: 24
- sheet pile walls, rema-41, V1: 95; V2: 24
- soil saw, rema-88, V1: 95; V2: 25

Bottom seal technologies

- jet grouting, rema-85, V1: 95; V2: 26
- microtunneled high-density polyethylene, rema-86, V1: 95; V2: 26
- vibrated plastic tube bottom seal, rema-87, V1: 95; V2: 26

Capping technologies

- capping, rema-46, V1: 95; V2: 24
- intruder barriers, rema-94, V2: 24

Destruction technologies

- calcining/sintering, rema-98, V1: 97; V2: 27
- incineration, rema-95, V1: 97; V2: 27
- in situ biodegradation, rema-110, V1: 96; V2: 26
- in situ heating, rema-99, V2: 26
- in situ vitrification (buried waste), rema-100, V1: 96; V2: 29
- low-temperature ashing, rema-7, V1: 97; V2: 27
- vitrification, rema-117, V1: 97; V2: 29

Drain technologies

- biopolymer drains, rema-44, V1: 95; V2: 25
- french drains, rema-43, V1: 95; V2: 25
- horizontal wells, rema-45, V1: 95; V2: 25

Excavation technologies

- borehole mining, rema-4, V1: 96; V2: 31
- modular excavation, rema-122, V1: 96; V2: 32
- precision excavation, rema-90, V1: 96; V2: 31
- remote excavation, rema-38, V1: 96; V2: 31

- solidify and mine (freeze and mine), rema-10, V1: 96; V2: 32
- vacuum loader (buried waste), rema-101, V1: 96; V2: 33

Fixation technologies

- cementitious solidification, rema-9, V1: 97; V2: 28
- ceramic encapsulation, rema-116, V1: 97; V2: 29
- in situ chemical grouting, rema-2, V1: 96; V2: 28
- in situ particulate grouting, rema-3, V1: 96; V2: 27
- in situ vitrification (buried waste), rema-100, V1: 96; V2: 29
- polymer-impregnated concrete/polymer modified concrete, rema-115, V1: 97; V2: 29
- sulfur polymer cement, rema-114, V1: 97; V2: 28
- thermoplastic encapsulation, rema-112, V1: 97; V2: 28
- thermoset encapsulation, rema-113, V1: 97; V2: 28
- vitrification, rema-117, V1: 97; V2: 29

Physical separation

- fracted air stripping, rema-89, V1: 96; V2: 30
- freeze purification, rema-91, V1: 96; V2: 31
- gravity sorting, rema-8, V1: 96; V2: 31
- physical sorting, rema-121, V1: 96; V2: 30
- shredding and magnetic separation, rema-93, V1: 96; V2: 30
- soil washing, rema-6, V2: 30
- thermal desorption, rema-92, V1: 96; V2: 30

Wall technologies

- cryogenic barriers, rema-58, V1: 95; V2: 25
- hydromill, rema-84, V1: 95; V2: 25
- slurry wall with high-density polyethylene insert, rema-83, V1: 95; V2: 24
- soil saw, rema-88, V1: 95; V2: 25

Buried waste (physical problem areas), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Field method technologies

- ground-water discharge location, char-259, V1: 65; V2: 18
- in situ ground-water flow meter, char-258, V1: 65; V2: 18

Laboratory method technologies

- optical microscopy, char-32, V1: 65; V2: 18
- particle size analysis, char-26, V1: 65; V2: 18

Buried waste (radioactive elements), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Field method technologies

- advanced radiation monitors, char-269, V1: 62; V2: 12
- alpha track etch detectors for surface alpha contamination, char-96, V1: 62; V2: 13
- bubble dosimeters for neutron flux, char-216, V1: 62; V2: 12
- electret passive surface alpha monitor, char-95, V1: 62; V2: 13

- electromagnetic offset log survey, char-272, V2: 19
- fiber-optic chemical sensors, char-25, V1: 65; V2: 19
- hydrofracture ground water monitoring, char-274, V1: 65; V2: 19
- long-range alpha detector, char-65, V1: 62; V2: 12
- passive monitors for weak beta radionuclides, char-102, V1: 62; V2: 12
- portable gamma-ray scintillometers, char-263, V1: 62; V2: 13
- proportional counter for alpha and beta activity, char-108, V1: 62, 63; V2: 12
- thermoluminescence dosimeter array for spatial characterization of alpha contamination, char-103, V1: 62; V2: 12
- Laboratory method technologies
 - gamma-ray spectrometry, char-268, V1: 63; V2: 14
 - liquid scintillation counting, char-267, V1: 63; V2: 14
 - neutron activation, char-107, V1: 63; V2: 13
 - neutron activation analysis, char-266, V1: 63-64; V2: 14
 - photon electron rejecting alpha liquid scintillation, char-97, V2: 14
 - proportional counter for alpha and beta activity, char-108, V1: 63, V1: 62; V2: 13
 - radioanalytical procedures, char-202, V1: 63; V2: 13
 - sodium iodide-germanium gamma spectroscopy, char-106, V1: 63, V1: 62; V2: 13

Buried waste (radionuclides), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Barrier technologies
 - grout curtains, rema-42, V1: 95; V2: 24
 - sheet pile walls, rema-41, V1: 95; V2: 24
 - slurry walls, rema-40, V1: 95; V2: 24
- Drain technologies
 - biopolymer drains, rema-44, V1: 95; V2: 25
 - french drains, rema-43, V1: 95; V2: 25
 - horizontal wells, rema-45, V1: 95; V2: 25

Buried waste, robotics and automation alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

- Controls—algorithms technologies
 - combined mobility /manipulation, roba-34, V1: 115, 122; V2: 53
 - control modes, roba-27, V1: 115, 122; V2: 52
 - emergency shutdown, roba-37, V1: 115, 122; V2: 53
 - manipulation (Cartesian control), roba-31, V1: 115, 122; V2: 53
 - manipulation (joint control), roba-30, V1: 115, 122; V2: 53
 - manipulation (redundancy control), roba-33, V1: 115, 122; V2: 53
 - manipulation (special purpose control), roba-32, V1: 115, 122; V2: 53
 - safety (collision avoidance), roba-35, V1: 115, 122; V2: 53

- safety (load/rate limiting), roba-36, V2: 53
- vehicle/mobility driving, roba-28, V1: 115, 122; V2: 52
- vehicle/mobility navigation, roba-29, V1: 115, 122; V2: 53
- Controls—human/machine interface technologies
 - console (data handling methods), roba-39, V1: 116, 122; V2: 54
 - console (fixed/mobile/suitcase), roba-38, V1: 116, 122; V2: 54
 - operator interface (command input), roba-40, V1: 116, 122; V2: 54
 - operator interface (operator assistance), roba-41, V1: 116, 123; V2: 54
 - operator interface (status/alert system), roba-42, V1: 116, 123; V2: 54
- Mechanical—end-of-arm tooling technologies
 - end-effector changeout mechanisms, roba-24, V1: 115, 122; V2: 52
 - end effectors/alternatives, roba-23, V1: 115, 122; V2: 52
 - force limiting/compliant mechanisms, roba-26, V1: 115, 122; V2: 52
 - general gripper/tool interface, roba-25, V1: 115, 122; V2: 52
- Mechanical—manipulation technologies
 - compact, high-capacity manipulators, roba-19, V1: 115, 122; V2: 52
 - dexterous manipulators, roba-16, V1: 115, 122; V2: 51
- Mechanical—mechanism technologies
 - stabilization/support mechanisms or booms, roba-22, V1: 115, 122; V2: 52
 - tool caddies, roba-21, V1: 115, 122; V2: 52
- Mechanical—mobility technologies
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spectroscopy, char-78, V1: 63; V2: 14
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alternatives for, in WAGs 1, 5, 8, and 9**

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cryogenic barriers, rema-58, V1: 99; V2: 41
grout curtains, rema-42, V1: 100; V2: 40
sheet pile walls, rema-41, V1: 100; V2: 41
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Chemical separation technologies

soil washing, rema-51, V1: 100; V2: 41

Drain technologies

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french drains, rema-43, V1: 99; V2: 40
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Excavation technologies

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mechanical excavation, rema-50, V1: 100;
V2: 42
vacuum loaders, rema-49, V1: 100; V2: 42

Fixation technologies

in situ fixation, rema-57, V1: 100; V2: 42
in situ vitrification (impoundments), rema-59,
V1: 100; V2: 42

Physical separation technologies

in situ soil flushing, rema-47, V1: 100;
V2: 41
sludge drying, rema-56, V1: 100; V2: 41
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**Impoundments (organics), characterization
alternatives for, in WAGs 1, 5, 8, and 9**

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V1: 64; V2: 16
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detectors, char-5, V1: 64; V2: 16
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polycyclic aromatic hydrocarbons,
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decontamination agents, char-206,
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**Impoundments (organics), remedial action
alternatives for, in WAGs 1, 5, 8, and 9**

Barrier technologies

clay/bentonite additives, rema-60, V1: 100;
V2: 41
cryogenic barriers, rema-58, V1: 99; V2: 41
grout curtains, rema-42, V1: 100; V2: 40
sheet pile walls, rema-41, V1: 100; V2: 41
slurry walls, rema-40, V1: 100; V2: 41

Chemical separation technologies

soil washing, rema-51, V1: 100; V2: 41

Drain technologies

biopolymer drains, rema-44, V1: 99; V2: 40
french drains, rema-43, V1: 99; V2: 40
horizontal wells, rema-45, V1: 99; V2: 40

Excavation technologies

dredging, rema-48, V1: 100; V2: 42
mechanical excavation, rema-50, V1: 100;
V2: 42
vacuum loaders, rema-49, V1: 100; V2: 42

Fixation technologies

in situ fixation, rema-57, V1: 100; V2: 42
in situ vitrification (impoundments), rema-59,
V1: 100; V2: 42

Physical separation technologies

in situ soil flushing, rema-47, V1: 100;
V2: 41
sludge drying, rema-56, V1: 100; V2: 41
soil washing, rema-51, V1: 100; V2: 41

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and 9**

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characterization alternatives for, in WAGs 1, 5, 8,
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activity, char-108, V1: 63, V1: 62; V2: 12

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spatial characterization of alpha
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**Impoundments (radionuclides), remedial action
alternatives for, in WAGs 1, 5, 8, and 9**

Barrier technologies

clay/bentonite additives, rema-60, V1: 100;
V2: 41
cryogenic barriers, rema-58, V1: 99; V2: 41
grout curtains, rema-42, V1: 100; V2: 40
sheet pile walls, rema-41, V1: 100; V2: 41
slurry walls, rema-40, V1: 100; V2: 41

Capping technologies

capping, rema-46, V1: 99; V2: 40

Chemical separation technologies

soil washing, rema-51, V1: 100; V2: 41

Drain technologies

biopolymer drains, rema-44, V1: 99; V2: 40
french drains, rema-43, V1: 99; V2: 40
horizontal wells, rema-45, V1: 99; V2: 40

Impoundments (radionuclides), remedial action alternatives for, in WAGs 1, 5, 8, and 9 (continued)

Excavation technologies

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mechanical excavation, rema-50, V1: 100;
V2: 42
vacuum loaders, rema-49, V1: 100; V2: 42

Fixation technologies

in situ fixation, rema-57, V1: 100; V2: 42
in situ vitrification (impoundments), rema-59,
V1: 100; V2: 42

Physical separation technologies

in situ soil flushing, rema-47, V1: 100;
V2: 41
sludge drying, rema-56, V1: 100; V2: 41
soil washing, rema-51, V1: 100; V2: 41

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V2: 53
manipulation (Cartesian control), roba-31,
V1: 115, 122; V2: 53
manipulation (joint control), roba-30,
V1: 115, 122; V2: 53
manipulation (redundancy control), roba-33,
V1: 115, 122; V2: 53
manipulation (special purpose control),
roba-32, V1: 115, 122; V2: 53
safety (collision avoidance), roba-35, V1: 115,
122; V2: 53
safety (load/rate limiting), roba-36, V2: 53
vehicle/mobility driving, roba-28, V1: 115,
122; V2: 52
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Controls—human/machine interface technologies

console (data handling methods), roba-39,
V1: 116, 122; V2: 54
console (fixed/mobile/suitcase), roba-38,
V1: 116, 122; V2: 54
operator interface (command input), roba-40,
V1: 116, 122; V2: 54
operator interface (operator assistance),
roba-41, V1: 116, 123; V2: 54
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roba-42, V1: 116, 123; V2: 54

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end-effector changeout mechanisms, roba-24,
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122; V2: 52
force limiting/compliant mechanisms,
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Mechanical—manipulation technologies

compact, high-capacity manipulators,
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Mechanical—mechanism technologies

stabilization/support mechanisms or booms,
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tool caddies, roba-21, V1: 115, 122; V2: 52

Mechanical—mobility technologies

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failure recovery systems for mobile platforms,
roba-11, V1: 115, 122; V2: 51
long-arm deployed robotic platforms, roba-9,
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V1: 115, 122; V2: 51
specialized robotic deployment platforms,
roba-7, V1: 115, 122; V2: 51
transportation methods for mobile platforms,
roba-12, V1: 115, 122; V2: 51
wheeled/tracked vehicle, roba-1, V1: 115,
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handling, roba-56, V1: 116, 123; V2: 56
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123; V2: 55
proximity probes as control sensors, roba-51,
V1: 116, 123; V2: 55
tooling sensors, roba-52, V1: 116, 123;
V2: 55

Sensors—perception technologies

force/torque sensors, roba-46, V1: 116, 123;
V2: 55
proximity probes, roba-45, V1: 116, 123;
V2: 54
range finders, roba-44, V1: 116, 123; V2: 54
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techniques, rema-29, V1: 97; V2: 38
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techniques, rema-28, V1: 97; V2: 38

Fixation technologies

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grouting, rema-25, V1: 97; V2: 38
in situ solidification using polymer grouting,
rema-32, V1: 98; V2: 39

- in situ solidification using silicate-based formulations, rema-26, V1: 98; V2: 39
- in situ solidification using thermoplastic techniques, rema-33, V1: 98; V2: 39
- in situ treatment using in situ vitrification, rema-30, V1: 98; V2: 39
- Incineration**, cement kiln, rema-14, V1: 99; V2: 35
- Incineration**, rema-12, V1: 99; V2: 34
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- Buried waste (inorganics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
 - Ground water and surface water (inorganics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
 - Ground water and surface water (inorganics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
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 - Pipelines (inorganics), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8
 - Pits and trenches (inorganics), characterization alternatives for, in WAG 7
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- In situ chemical grouting**, rema-2, V1: 96; V2: 28
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- In situ fixation**, rema-57, V1: 100; V2: 42
- In situ ground-water flow meter**, char-258, V1: 65; V2: 18
- In situ grouting (pipelines)**, rema-52, V1: 99; V2: 47
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- In situ particulate grouting**, rema-3, V1: 96; V2: 27
- In situ precipitation**, rema-62, V1: 101; V2: 62
- In situ soil flushing**, rema-47, V1: 100; V2: 41
- In situ solidification**, rema-5, V1: 95; V2: 23
- In situ solidification using cement-based grouting**, rema-25, V1: 97; V2: 38
- In situ solidification using polymer grouting**, rema-32, V1: 98; V2: 39
- In situ solidification using silicate-based formulations**, rema-26, V1: 98; V2: 39
- In situ solidification using thermoplastic techniques**, rema-33, V1: 98; V2: 39
- In situ treatment using in situ vitrification**, rema-30, V1: 98; V2: 39
- In situ vitrification**, rema-18, V1: 99; V2: 36
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- In situ vitrification (impoundments)**, rema-59, V1: 100; V2: 42
- In situ vitrification (pits/trenches)**, rema-35, V1: 98; V2: 37
- Integrated automated analytical**, roba-55, V1: 116, 123; V2: 55
- Intruder barriers**, rema-94, V2: 24
- Ion chromatography**, char-50, V1: 63; V2: 15

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Low-level waste. See

Radionuclides, regulatory compliance for

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Low-level waste, technologies for. See

Buried waste (low-level waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6 and 7

Inactive low-level waste tanks (radiologically contaminated tank contents), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Pits and trenches (low-level waste), remedial action alternatives for, in WAG 7

Soils and sediments (low-level waste), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Low-level waste tanks, robotics and automation alternatives for, in WAGs 1, 5, 8, and 9

Controls—algorithms technologies

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emergency shutdown, roba-37, V1: 115, 122; V2: 53

manipulation (Cartesian control), roba-31, V1: 115, 122; V2: 53

manipulation (joint control), roba-30, V1: 115, 122; V2: 53

manipulation (redundancy control), roba-33, V1: 115, 122; V2: 53

manipulation (special purpose control), roba-32, V1: 115, 122; V2: 53

safety (collision avoidance), roba-35, V1: 115, 122; V2: 53

safety (load/rate limiting), roba-36, V2: 53

vehicle/mobility driving, roba-28, V1: 115, 122; V2: 52

vehicle/mobility navigation, roba-29, V1: 115, 122; V2: 53

Controls—human/machine interface technologies

console (data handling methods), roba-39, V1: 116, 122; V2: 54

console (fixed/mobile/suitcase), roba-38, V1: 116, 122; V2: 54

operator interface (command input), roba-40, V1: 116, 122; V2: 54

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operator interface (status/alert system), roba-42, V1: 116, 123; V2: 54

Mechanical—end-of-arm tooling technologies

end-effector changeout mechanisms, roba-24, V1: 115, 122; V2: 52

end effectors/alternatives, roba-23, V1: 115, 122; V2: 52

force limiting/compliant mechanisms, roba-26, V1: 115, 122; V2: 52

general gripper/tool interface, roba-25, V1: 115, 122; V2: 52

Mechanical—manipulation technologies

compact, high-capacity manipulators, roba-19, V1: 115, 122; V2: 52

dexterous manipulators, roba-16, V1: 115, 122; V2: 51

Mechanical—mechanism technologies

stabilization/support mechanisms or booms, roba-22, V1: 115, 122; V2: 52

tool caddies, roba-21, V1: 115, 122; V2: 52

Mechanical—mobility technologies

data/signal transmission, roba-13, V1: 115, 122; V2: 51

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Sensors—control technologies

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123; V2: 55
proximity probes as control sensors, roba-51,
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Sensors—perception technologies

force/torque sensors, roba-46, V1: 116, 123;
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proximity probes, roba-45, V1: 116, 123;
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Manipulation (joint control), roba-30, V1: 115,
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Manipulation (redundancy control), roba-33,
V1: 115, 122; V2: 53

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Maximum contaminant levels. *See*
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Buried waste (metals), remedial action
alternatives for, in WAGs 1, 3, 4, 5, 6,
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Impoundments (metals), remedial action
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Pipelines (metals), remedial action alternatives
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- personnel monitoring, char-52, V1: 60; V2: 6
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 - sampling of heterogeneous wastes, char-270,
V1: 59; V2: 4
 - sampling USTs for volatile organics,
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 - SEAMIST inverted membrane, char-273,
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 - sediment sampling from restricted access
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- supercritical fluid extraction of inorganics,
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- electron spectroscopy for chemical analysis,
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- energy dispersive X-ray spectroscopy,
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- glow discharge ionization mass spectroscopy,
char-56, V1: 63; V2: 16
- inductively coupled plasma—mass
spectroscopy, char-78, V1: 63; V2: 14
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char-77, V1: 63; V2: 14
- ion chromatography, char-50, V1: 63; V2: 15
- neutron activation analysis, char-266,
V1: 63-64; V2: 14
- particle-induced X-ray emission, char-17,
V1: 63; V2: 15
- powder X-ray diffraction, char-31, V1: 64;
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- pipeline excavation, rema-53, V1: 99; V2: 47

Fixation technologies

- in situ grouting (pipelines), rema-52, V1: 99;
V2: 47

Pipelines (organics), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Field method technologies

- direct sampling ion trap mass spectrometry, char-90, V1: 64; V2: 16
- gas chromatography in the field, char-262, V1: 64; V2: 17
- PCB immunoassay kit, char-99, V2: 16
- portable gas chromatograph/electron capture detector for analyzing PCBs, char-100, V1: 64; V2: 16
- portable volatile organic compounds detectors, char-5, V1: 64; V2: 16
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Laboratory method technologies

- analytical methods for chelators and decontamination agents, char-206, V1: 64; V2: 17
- capillary zone electrophoresis, char-207, V1: 64; V2: 17
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- solid phase microextraction analytical method, char-211, V1: 65; V2: 18
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Pipelines (organics), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Excavation technologies

- pipeline excavation, rema-53, V1: 99; V2: 47

Fixation technologies

- in situ grouting (pipelines), rema-52, V1: 99; V2: 47

Pipelines (physical problem areas), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Field method technologies

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Laboratory method technologies

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- particle size analysis, char-26, V1: 65; V2: 18

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- bubble dosimeters for neutron flux, char-216, V1: 62; V2: 12

- electret passive surface alpha monitor, char-95, V1: 62; V2: 13

- electromagnetic offset log survey, char-272, V2: 19

- fiber-optic chemical sensors, char-25, V1: 65; V2: 19

- hydrofracture ground water monitoring, char-274, V1: 65; V2: 19

- long-range alpha detector, char-65, V1: 62; V2: 12

- passive monitors for weak beta radionuclides, char-102, V1: 62; V2: 12

- portable gamma-ray scintillometers, char-263, V1: 62; V2: 13

- proportional counter for alpha and beta activity, char-108, V1: 63, V1: 62; V2: 12

- thermoluminescence dosimeter array for spatial characterization of alpha contamination, char-103, V1: 62; V2: 12

Laboratory method technologies

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- liquid scintillation counting, char-267, V1: 63; V2: 14

- neutron activation, char-107, V1: 63; V2: 13

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- proportional counter for alpha and beta activity, char-108, V1: 63, V1: 62; V2: 13

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Pipelines (radionuclides), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Excavation technologies

- pipeline excavation, rema-53, V1: 99; V2: 47

Fixation technologies

- in situ grouting (pipelines), rema-52, V1: 99; V2: 47

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- Description of remedial action alternatives for, V1: 80

- Description of science and technology needs for remedial action alternatives, V1: 87

- Problem definition, V1: 16

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- Excavation technologies
 - remote excavation, rema-38, V1: 98; V2: 37
- Fixation technologies
 - in situ grouting (pits/trenches), rema-37, V1: 98; V2: 37
 - in situ vitrification (pits/trenches), rema-35, V1: 98; V2: 37
- Physical separation technologies
 - in situ extraction, rema-39, V1: 98; V2: 37

Pits and trenches (general problem areas), characterization alternatives for, in WAG 7

- Data analysis management technologies
 - analysis of censored data, char-249, V1: 61; V2: 10
 - application of approximate reasoning to data analysis/evaluation, char-234, V1: 61; V2: 9
 - automated scanning and conversion of engineering drawings, dism-155, V1: 61; V2: 9
 - client/server access to standards and regulatory guidelines, dism-153, V1: 61; V2: 8
 - client/server architecture for data base access, dism-157, V1: 61; V2: 9
 - computer-aided task analysis and procedure preparation, dism-172, V1: 61; V2: 9
 - computer-based training systems, dism-191, V1: 61; V2: 9
 - configuration management system, char-229, V1: 62; V2: 11
 - criticality indices, char-44, V1: 61; V2: 10
 - data access services, dism-154, V1: 61; V2: 8
 - detection and measurement systems with feature extraction, char-223, V1: 62; V2: 11
 - dynamic modeling of material transport, char-255, V1: 62; V2: 11
 - fractals used to select models for material transport in porous media, char-225, V1: 62; V2: 11
 - geographic information system for DOE sites, dism-181, V1: 61; V2: 8
 - hazard analysis expert system, char-233, V1: 61; V2: 9
 - hypertext information systems, dism-158, V1: 61; V2: 10
 - modeling of volatile organic compounds migration in porous materials, char-53, V1: 61; V2: 10
 - multisensor fusion measurement systems, char-222, V1: 62; V2: 11
 - network architecture with integrated workstations, char-221, V2: 8
 - project information access services, dism-151, V1: 61; V2: 8
 - quality control for measurement processes, char-250, V1: 61; V2: 10
 - simulated walkthrough facility for robotics task sequence analysis, dism-171, V1: 61; V2: 9

- spatial sample and data analysis, char-253, V1: 61; V2: 10
- statistical methods for the analysis of large data sets, char-251, V1: 61; V2: 10
- stored material neural net identification system, char-242, V1: 62; V2: 11
- subsurface complexation model, char-45, V1: 62; V2: 11
- task scheduling aids, char-241, V1: 61; V2: 10
- Detection/measurement—field method technologies
 - air monitoring, char-59, V1: 60; V2: 6
 - electrical and electromagnetic detection of ground and geologic features, char-125, V1: 60; V2: 6
 - electrochemical methods, char-10, V1: 60; V2: 7
 - fiber-optic chemical sensors, char-25, V1: 65, V1: 59; V2: 5
 - ground-penetrating radar, char-124, V1: 60; V2: 6
 - immunoassay detection, char-23, V1: 60; V2: 5
 - infrared spectroscopy (wavelength dispersion), char-18, V1: 60; V2: 6
 - ion mobility mass spectrometry, char-264, V1: 59; V2: 5
 - magnetics, char-128, V1: 60; V2: 6
 - microgravity methods, char-127, V1: 60; V2: 6
 - optical absorption spectroscopy, char-27, V1: 60; V2: 5
 - personnel monitoring, char-52, V1: 60; V2: 6
 - portable luminescence detection, char-92, V1: 60; V2: 7
 - portable Raman spectrometer, char-84, V1: 60; V2: 5
 - seismic methods (retraction, profiling, reflection), char-126, V1: 60; V2: 6
 - tomographic seismic monitoring, char-60, V1: 60; V2: 6
 - ultrasonic ranging and data system, char-123, V1: 60; V2: 6
- Detection/measurement—laboratory method technologies
 - contamination control—analytical equipment, char-204, V1: 60; V2: 7
 - Fourier transform infrared spectroscopy, char-8, V1: 60; V2: 7
 - isotopic dilution mass spectrometry, char-48, V1: 60; V2: 7
 - laser ionization mass spectrometry, char-4, V1: 61; V2: 8
 - nuclear magnetic resonance, char-11, V1: 60; V2: 7
 - secondary ion mass spectrometry, char-3, V1: 60; V2: 7
 - ultraviolet/visible spectroscopy, char-9, V1: 60; V2: 8
- Sample collection technologies
 - in situ solid phase microextraction of organics, char-210, V1: 59; V2: 3
 - membranes for sample collection and concentration, char-55, V1: 59; V2: 4

- multiangle drilling for depth profiling of contaminants, char-64, V1: 59; V2: 4
- sampling and mixing methods, char-81, V1: 59; V2: 3
- sampling of heterogeneous wastes, char-270, V1: 59; V2: 4
- sampling USTs for volatile organics, char-257, V1: 59; V2: 3
- SEAMIST inverted membrane, char-273, V1: 65; V2: 19
- sediment sampling from restricted access locations, char-276, V1: 59; V2: 4
- soil/sediment sampling for volatile organics analysis, char-256, V1: 59; V2: 3
- solid sorbent sampling in airborne organics, char-254, V1: 59; V2: 3
- Sample preparation technologies
 - adaptation of the EPA TCLP leaching test for use with radioactive samples, char-209, V1: 59; V2: 4
 - high-pressure ashing, char-203, V1: 59; V2: 5
 - metallographic sectioning and preparation, char-67, V1: 59; V2: 4
 - microwave digestion, char-19, V1: 59; V2: 4
 - radioactive sample preparation, char-205, V1: 59; V2: 4
 - supercritical fluid extraction of inorganics, char-201, V1: 59; V2: 5
 - supercritical fluid extraction of organics, char-208, V1: 59; V2: 4
- Sampling design technologies
 - optimization of sampling designs, char-71, V1: 59; V2: 3
 - sampling program configuration management system, char-228, V1: 59; V2: 3
 - sequential sampling plans, char-252, V1: 59; V2: 3

Pits and trenches (inorganics), characterization alternatives for, in WAG 7

- Field method technologies
 - atomic emission spectroscopy, char-76, V1: 63; V2: 14
 - portable X-ray fluorescence, char-6, V1: 63; V2: 14
 - X-ray fluorescence for in situ monitoring of toxic heavy metals, char-219, V1: 63; V2: 14
- Laboratory method technologies
 - atomic emission spectroscopy, char-76, V1: 63; V2: 15
 - auger electron spectroscopy, char-2, V1: 64; V2: 16
 - cold vapor (mercury) analysis, char-24, V1: 64; V2: 15
 - electron diffraction, char-37, V1: 63; V2: 15
 - electron spectroscopy for chemical analysis, char-1, V1: 64; V2: 16
 - energy dispersive X-ray spectroscopy, char-35, V1: 63; V2: 15
 - glow discharge ionization mass spectroscopy, char-56, V1: 63; V2: 16
 - inductively coupled plasma—mass spectroscopy, char-78, V1: 63; V2: 14

- inductively coupled plasma spectroscopy, char-77, V1: 63; V2: 14
- ion chromatography, char-50, V1: 63; V2: 15
- neutron activation analysis, char-266, V1: 63–64; V2: 14
- particle-induced X-ray emission, char-17, V1: 63; V2: 15
- powder X-ray diffraction, char-31, V1: 64; V2: 16
- scanning electron microscopy, char-33, V1: 63; V2: 15
- transmission electron microscopy, char-34, V1: 63; V2: 15
- wavelength dispersive X-ray spectroscopy, char-36, V1: 63; V2: 15

Pits and trenches (low-level waste), remedial action alternatives for, in WAG 7

- Excavation technologies
 - remote excavation, rema-38, V1: 98; V2: 37
- Fixation technologies
 - in situ grouting (pits/trenches), rema-37, V1: 98; V2: 37
 - in situ vitrification (pits/trenches), rema-35, V1: 98; V2: 37
- Physical separation technologies
 - in situ extraction, rema-39, V1: 98; V2: 37

Pits and trenches (metals), remedial action alternatives for, in WAG 7

- Capping technologies
 - capping (pits/trenches), rema-36, V1: 98; V2: 37

Pits and trenches (organics), characterization alternatives for, in WAG 7

- Field method technologies
 - direct sampling ion trap mass spectrometry, char-90, V1: 64; V2: 16
 - gas chromatography in the field, char-262, V1: 64; V2: 17
 - PCB immunoassay kit, char-99, V2: 16
 - portable gas chromatograph/electron capture detector for analyzing PCBs, char-100, V1: 64; V2: 16
 - portable volatile organic compounds detectors, char-5, V1: 64; V2: 16
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Soils and sediments (PCBs), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radioactive elements), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radionuclides), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

WAG 5 (continued)

- Soils and sediments (refractory organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13
- Soils and sediments, robotics and automation alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13
- Soils and sediments (volatile organic hydrocarbons), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13
- Tanks (general problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9
- Tanks (inorganics), characterization alternatives for, in WAGs 1, 5, 8, and 9
- Tanks (organics), characterization alternatives for, in WAGs 1, 5, 8, and 9
- Tanks (physical problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9
- Tanks (radioactive elements), characterization alternatives for, in WAGs 1, 5, 8, and 9

WAG 6. See

- Buried waste (buried bulk equipment items), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (composition determination), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (general problem areas), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (HFIR control plates), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (high-specific activity europium in HFIR, TRU oxides, and concentrated low-level waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (inorganics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (low-level waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (metals), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (mixed waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (organics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (organics), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (physical problem areas), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (radioactive elements), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (radionuclides), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste, robotics and automation alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Buried waste (trench subsidence), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7
- Ground water and surface water (general problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (inorganics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (inorganics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (nitrates), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (organics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (organics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (physical problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (PCBs), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (radioactive elements), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (radionuclides), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water, robotics and automation alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (tritium), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Ground water and surface water (volatile organic compounds), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11
- Soils and sediments (general problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13
- Soils and sediments (inorganics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13
- Soils and sediments (low-level waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13
- Soils and sediments (metals), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (mixed waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (nitrates), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (physical problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (PCBs), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radioactive elements), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radionuclides), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (refractory organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments, robotics and automation alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (volatile organic hydrocarbons), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

WAG 7. See

Buried waste (buried bulk equipment items), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (composition determination), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (general problem areas), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (HFIR control plates), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (high-specific activity europium in HFIR, TRU oxides, and concentrated low-level waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (inorganics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (low-level waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (metals), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (mixed waste), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (organics), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (organics), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (physical problem areas), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (radioactive elements), characterization alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (radionuclides), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste, robotics and automation alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Buried waste (trench subsidence), remedial action alternatives for, in WAGs 1, 3, 4, 5, 6, and 7

Pipelines (general problem areas), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (inorganics), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (metals), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (organics), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (organics), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (physical problem areas), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (radioactive elements), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (radionuclides), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (well bores), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pits and trenches (contaminated sludge/soil), remedial action alternatives for, in WAG 7

Pits and trenches (general problem areas), characterization alternatives for, in WAG 7

Pits and trenches (inorganics), characterization alternatives for, in WAG 7

Pits and trenches (low-level waste), remedial action alternatives for, in WAG 7

Pits and trenches (metals), remedial action alternatives for, in WAG 7

Pits and trenches (organics), characterization alternatives for, in WAG 7

Pits and trenches (organics), remedial action alternatives for, in WAG 7

Pits and trenches (physical problem areas), characterization alternatives for, in WAG 7

Pits and trenches (radioactive elements), characterization alternatives for, in WAG 7

Pits and trenches (radionuclides), remedial action alternatives for, in WAG 7

WAG 7 (continued)

Soils and sediments (general problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (inorganics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (low-level waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (metals), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (mixed waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (nitrates), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (physical problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (PCBs), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radioactive elements), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radionuclides), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (refractory organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments, robotics and automation alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (volatile organic hydrocarbons), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

WAG 8. See

Ground water and surface water (general problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (nitrates), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (physical problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (PCBs), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radioactive elements), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radionuclides), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water, robotics and automation alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (tritium), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (volatile organic compounds), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Impoundments (general problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (inorganics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (metals), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (organics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (organics), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (physical problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (radioactive elements), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (radiologically contaminated tank contents), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (radionuclides), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments, robotics and automation alternatives for, in WAGs 1, 5, 8, and 9

Inactive low-level waste tanks (radiologically contaminated tank contents), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Low-level waste tanks, robotics and automation alternatives for, in WAGs 1, 5, 8, and 9

Pipelines (general problem areas), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (inorganics), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (metals), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (organics), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (organics), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (physical problem areas), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (radioactive elements), characterization alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (radionuclides), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Pipelines (well bores), remedial action alternatives for, in WAGs 1, 4, 5, 7, and 8

Tanks (general problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (inorganics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (organics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (physical problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (radioactive elements), characterization alternatives for, in WAGs 1, 5, 8, and 9

WAG 9. See

Ground water and surface water (general problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (nitrates), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (physical problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (PCBs), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radioactive elements), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radionuclides), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water, robotics and automation alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (tritium), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (volatile organic compounds), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Impoundments (general problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (inorganics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (metals), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (organics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (organics), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (physical problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (radioactive elements), characterization alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (radiologically contaminated tank contents), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments (radionuclides), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Impoundments, robotics and automation alternatives for, in WAGs 1, 5, 8, and 9

Inactive low-level waste tanks (radiologically contaminated tank contents), remedial action alternatives for, in WAGs 1, 5, 8, and 9

Low-level waste tanks, robotics and automation alternatives for, in WAGs 1, 5, 8, and 9

Tanks (general problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (inorganics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (organics), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (physical problem areas), characterization alternatives for, in WAGs 1, 5, 8, and 9

Tanks (radioactive elements), characterization alternatives for, in WAGs 1, 5, 8, and 9

WAG 10. See

Ground water and surface water (general problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (nitrates), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

WAG 10 (continued)

Ground water and surface water (physical problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (PCBs), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radioactive elements), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radionuclides), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water, robotics and automation alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (tritium), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (volatile organic compounds), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Hydrofracture (general problem areas), characterization alternatives for, in WAG 10

Hydrofracture (grout sheets), remedial action alternatives for, in WAG 10

Hydrofracture (inorganics), characterization alternatives for, in WAG 10

Hydrofracture (organics), characterization alternatives for, in WAG 10

Hydrofracture (physical problem areas), characterization alternatives for, in WAG 10

Hydrofracture (radioactive elements), characterization alternatives for, in WAG 10

WAG 11. See

Ground water and surface water (general problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (inorganics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (nitrates), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (organics), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (physical problem areas), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (PCBs), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radioactive elements), characterization alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (radionuclides), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water, robotics and automation alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (tritium), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Ground water and surface water (volatile organic compounds), remedial action alternatives for, in WAGs 2, 3, 4, 5, 6, 8, 9, 10, and 11

Soils and sediments (general problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (inorganics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (low-level waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (metals), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (mixed waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (nitrates), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (physical problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (PCBs), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radioactive elements), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radionuclides), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (refractory organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments, robotics and automation alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (volatile organic hydrocarbons), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

WAG 13. See

Soils and sediments (general problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (inorganics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (low-level waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (metals), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (mixed waste), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (nitrates), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (organics), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (physical problem areas), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (PCBs), remedial action alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

Soils and sediments (radioactive elements), characterization alternatives for, in WAGs 1, 2, 3, 4, 5, 6, 7, 11, and 13

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Waste Management

HOW TO USE THIS INDEX

The Waste Management (WM) Index provides a comprehensive list of site problems, problem area/constituents, remedial technologies, and regulatory terms discussed in the WM sections of the *Oak Ridge National Laboratory Technology Logic Diagram*. All entries provide specific page numbers, or cross-reference entries that provide specific page numbers, in the WM volumes (Vol. 1, Pt. C; Vol. 2, Pt. C; and appropriate parts of Vol. 3).

Page numbers are located at the end of main entries or at the end of subentries. References to the WM Vol. 1, Pt. C (*Technology Evaluation*), are indicated by "V1:" and followed by a page number, while references to the WM Vol. 2, Pt. C (*Technology Logic Diagrams*), are indicated by "V2:" and followed by a specific page number. Specific locations in Vols. 3 (*Technology Evaluation Data Sheets*) are given by the technology code numbers (e.g., wpro-117) because pages in this volume are unnumbered.

Cross-references are indicated by a *See* at the end of the main entry. Following the *See* is a list of other main entries, which provide specific page numbers.

Examples of index entries are provided below.

- A main entry (a specific technology), which consists of a title in bold and a locator. The locator gives specific page numbers—"wpro-117" (Vol. 3); "V1: 111" (Vol. 1, Pt. C); and "V2: 44, 143" (Vol. 2, Pt. C).

Technology name	Technology code no.	Vol. no.	Page no.	Vol. no.	Page nos.
↓	↓	↓	↓	↓	↓
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<div style="border: 1px solid black; width: 200px; margin: 0 auto; text-align: center;">locator</div>					

- Two main entries that cross-reference. The first example consists of an ORNL Problem and a *See* reference; the second example is the entry referenced, which provides specific page numbers:

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- Asphalt and building materials, mixed waste contaminated (fiberglass insulation, RAD, PCBs, oils, organics, inorganics), waste management alternatives for
- Combustible debris, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for
- Compactible debris, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for
- Concrete rubble, mixed waste contaminated (asbestos, PCBs, oils, RAD, organics, inorganics), waste management alternatives for
- Concrete rubble, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for
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Combustible debris, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

Compactible debris, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

Concrete rubble, mixed waste contaminated (asbestos, PCBs, oils, RAD, organics, inorganics), waste management alternatives for

Concrete rubble, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

Discarded filters, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

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Combustible debris, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

Combustible debris, RAD contamination only, waste management alternatives for

Compactible debris, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

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Scrap ferrous metals, mixed waste contaminated (steel, RAD, organics, inorganics, PCBs), waste management alternatives for

Scrap ferrous metals, RAD contamination only, waste management alternatives for

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Infectious and medical wastes, mixed waste contaminated (RCRA hazardous and/or RAD contaminated), waste management alternatives for

Listed wastes (halogenated solvents), mixed waste contaminated (RCRA hazardous and/or RAD contaminated), waste management alternatives for

Listed wastes (nonhalogenated solvents), mixed waste contaminated (RCRA hazardous and/or RAD contaminated), waste management alternatives for

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Nonradioactive hazardous waste, waste shipment alternatives for

Other RCRA hazardous wastes, mixed waste contaminated, (RCRA hazardous and/or RAD contaminated) waste management alternatives for

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Sanitary/industrial wastewater, mixed waste contaminated (RCRA hazardous and/or RAD contaminated), waste management alternatives for

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 - anaerobic digestion, wpro-225, V2: 118
- Chemical treatment technologies
 - gamma radiolysis, wpro-100, V2: 120
 - ozonation photolysis, wpro-214, V2: 120
 - solvent extraction, wpro-211/212, V2: 119
 - supercritical water oxidation, wpro-216, V2: 120
 - wet air oxidation, wpro-215, V2: 120
- Physical treatment technologies
 - adsorption, wpro-202/203, V2: 119
 - filtration, wpro-201, V2: 119
 - inorganic microporous filters, wpro-207, V2: 118
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- Thermal treatment technologies
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Sanitary/industrial wastewater, RAD and/or TRU contaminants only, waste management alternatives for

- Biological treatment technologies
 - aerobic digestion, wpro-224, V2: 121
 - anaerobic digestion, wpro-225, V2: 121
- Chemical treatment technologies
 - gamma radiolysis, wpro-100, V1: 119
 - solvent extraction, wpro-211/212, V1: 120
 - supercritical water oxidation, wpro-216, V1: 120
 - wet air oxidation, wpro-215, V1: 120
- Physical treatment technologies
 - adsorption, wpro-202/203, V1: 118
 - filtration, wpro-201, V1: 118
 - inorganic microporous filters, wpro-207, V1: 119
 - reverse osmosis, wpro-206, V1: 119
- Thermal treatment technologies
 - evaporation, wpro-223, V1: 120

Scanning electron microscopy, char-33, V1: 49; V2: 15

Scrap asbestos pipe insulation and transit, uncontaminated (no RAD or RCRA hazardous waste contamination), waste management alternatives for

- Physical treatment technologies
 - landfill disposal, wpro-131, V1: 106; V2: 135

Scrap building materials, RAD contamination only, waste management alternatives for

- Chemical treatment technologies
 - leaching and stripping, wpro-213, V1: 103; V2: 52
- Thermal treatment technologies
 - incineration, wpro-108, V1: 103; V2: 51

Scrap building materials, RAD contamination only, waste management alternatives for (continued)

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plasma arc furnace, wpro-107, V1: 104; V2: 51

Waste stabilization technologies
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Scrap ferrous metals, mixed waste contaminated (steel, RAD, organics, inorganics, PCBs), waste management alternatives for

Chemical treatment technologies
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leaching and stripping, wpro-213, V1: 99; V2: 30
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Physical treatment technologies
sonification, wpro-121, V1: 99; V2: 29

Thermal treatment technologies
plasma arc furnace, wpro-107, V1: 101; V2: 29
smelting, wpro-111, V1: 101; V2: 29
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Waste stabilization technologies
encapsulation, V1: 99; V2: 29

Scrap ferrous metals, RAD contamination only, waste management alternatives for

Chemical treatment technologies
electrochemical metal removal, wpro-205, V1: 102; V2: 53
leaching and stripping, wpro-213, V1: 103; V2: 54
solvent extraction, wpro-211/212, V1: 103; V2: 54

Physical treatment technologies
sonification, wpro-121, V1: 102; V2: 53

Thermal treatment technologies
plasma arc furnace, wpro-107, V1: 104; V2: 53
smelting, wpro-111, V1: 104; V2: 53

Waste stabilization technologies
encapsulation, V1: 102; V2: 53

Scrap ferrous metals, TRU contamination only, waste management alternatives for

Chemical treatment technologies
electrochemical metal removal, wpro-205, V1: 102; V2: 72
leaching and stripping, wpro-213, V1: 103; V2: 73
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Physical treatment technologies
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Thermal treatment technologies
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Waste stabilization technologies
encapsulation, V1: 102; V2: 72

Scrap ferrous metals, uncontaminated (no RAD or RCRA hazardous waste contamination), waste management alternatives for

Physical treatment technologies
landfill disposal, wpro-131, V1: 106; V2: 136
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Scrap nonferrous metals, mixed waste contaminated (RAD, PCBs, organics, inorganics), waste management alternatives for

Chemical treatment technologies
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gamma radiolysis, wpro-100, V1: 99; V2: 31
gas phase treatment, doon-16, V1: 99; V2: 32
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mond process, wpro-112, V1: 100; V2: 32
nitrate-ammonia-ceramic (NAC) process, wpro-105, V1: 100; V2: 32
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Physical treatment technologies
sonification, wpro-121, V1: 99; V2: 31

Thermal treatment technologies
incineration, wpro-108, V1: 100; V2: 32
smelting, wpro-111, V1: 101; V2: 33
thermal desorption, wpro-106, V1: 101; V2: 33

Waste stabilization technologies
encapsulation, V1: 99; V2: 31

Scrap nonferrous metals, RAD contamination only, waste management alternatives for

Chemical treatment technologies
electrochemical metal removal, wpro-205, V1: 102; V2: 55
gas phase (ClF₃) treatment, doon-16, V1: 103; V2: 55
leaching and stripping, wpro-213, V1: 103; V2: 54

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Physical treatment technologies
sonification, wpro-121, V1: 102; V2: 54

Thermal treatment technologies
incineration, wpro-108, V1: 103; V2: 55
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Waste stabilization technologies
encapsulation, V1: 102; V2: 54

Scrap nonferrous metals, TRU contamination only, waste management alternatives for

Chemical treatment technologies
electrochemical metal removal, wpro-205, V1: 102; V2: 74
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mond process, wpro-112, V1: 103; V2: 74
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- Physical treatment technologies
package to meet WIPP WAC, wpro-128,
V1: 105; V2: 73
- Thermal treatment technologies
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- Waste stabilization technologies
encapsulation, V1: 102; V2: 73
- Scrap nonferrous metals, uncontaminated (no
RAD or RCRA hazardous waste contamination),
waste management alternatives for**
- Chemical treatment technologies
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- Physical treatment technologies
landfill disposal, wpro-131, V1: 106; V2: 136
recycle/reuse, wpro-130, V1: 106; V2: 136
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- Scrap transite and scrap asbestos pipe and
insulation, mixed waste contaminated (asbestos,
PCBs, oils, RAD, organics, inorganics), waste
management alternatives for**
- Chemical treatment technologies
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solvent extraction (general), wpro-211/212,
V1: 100; V2: 23
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V1: 100; V2: 23
- Thermal treatment technologies
calcination/roasting, dcon-60, V1: 100;
V2: 24
incineration, wpro-108, V1: 100; V2: 24
plasma arc furnace, wpro-107, V1: 101;
V2: 24
- Scrap transite and scrap asbestos pipe and
insulation, RAD contamination only, waste
management alternatives for**
- Chemical treatment technologies
electropolishing/osmosis/migration, dcon-20,
V1: 102; V2: 49
gamma radiolysis, wpro-100, V2: 50
solvent extraction, wpro-211/212, V1: 103;
V2: 49
- Thermal treatment technologies
calcination/roasting, dcon-60, V1: 103;
V2: 50
incineration, wpro-108, V1: 103; V2: 50
plasma arc furnace, wpro-107, V1: 104;
V2: 51
- Waste stabilization technologies
encapsulation, V1: 102; V2: 49
- Scrubbers, wpro-211/212, V1: 123; V2: 131**
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126, 128, 130**
- Secondary ion mass spectroscopy, char-3, V1: 46;
V2: 7**
- Sediment sampling from restricted access
locations, char-276, V1: 45; V2: 4**
- Sell as scrap, wpro-130, V1: 106, 113; V2: 136, 138,
140, 141**
- Semivolatile organic constituents. See**
Waste off-gases (semivolatile organic
constituents), waste management
alternatives for
- Sequential sampling plans, char-252, V1: 45; V2: 3**
- Shallow land burial, wpro-132, V1: 108, 113, 142;
V2: 107, 142**
- Simulated walkthrough facility for robotics task
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- Sludge. See**
Coal yard runoff sludge, waste management
alternatives for
Waste processing sludges, mixed waste
contaminated (RAD, PCBs, organics,
inorganics), waste management
alternatives for
Waste processing sludges, RAD contamination
only, waste management alternatives for
Waste processing sludges, TRU contamination
only, waste management alternatives for
Waste processing sludges, uncontaminated (no
RAD or RCRA hazardous waste
contamination), waste management
alternatives for
- Smelting, wpro-111, V1: 101, 104; V2: 29, 33, 53,
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- Solid-liquid wastes (general problem area/
constituents), characterization alternatives
for**
- Data analysis/management technologies
analysis of censored data, char-249, V1: 47;
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engineering drawings, dism-154, V1: 47;
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analysis, dism-175, V1: 48; V2: 11
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regulatory guidelines, dism-152, V1: 46;
V2: 7
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access, dism-157, V1: 47; V2: 9
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**Solid-liquid wastes (general problem area/
constituents), characterization alternatives
for (continued)**

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(intelligent materials), char-240, V1: 48;
V2: 10

generalized object-oriented simulation soft-
ware, dism-173, V1: 48; V2: 11

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V1: 47; V2: 8

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for radioactive waste storage containers,
char-260, V1: 48; V2: 10

modeling of volatile organic compound's
migration in porous materials, char-53,
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workstations, char-221, V1: 46; V2: 7

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char-253, V1: 47; V2: 9

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data sets, char-251, V1: 47; V2: 9

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V2: 6

fiber-optic chemical sensors, char-25, V1: 46;
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immunoassay detection, char-23, V1: 46;
V2: 5

ion mobility mass spectrometry, char-264,
V1: 46; V2: 5

luminescence detection, char-92, V1: 46;
V2: 6

optical absorption spectroscopy, char-27,
V1: 46; V2: 5

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V1: 46; V2: 5

Detection/measurement laboratory methods

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Fourier transform infrared spectroscopy,
char-8, V1: 46; V2: 6

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concentration, char-55, V1: 45; V2: 3

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contaminants, char-64, V1: 45; V2: 4

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V1: 45; V2: 3

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V1: 45; V2: 4

sampling interface system for surface
contamination by organics, char-271,
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sampling underground storage tanks for
volatile organics, char-257, V1: 45; V2: 3

sediment sampling from restricted access
locations, char-276, V1: 45; V2: 4

solid sorbent sampling for airborne organics,
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vacuum-assisted reverse flow, solvent
extraction methods, char-62, V1: 45;
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Sample preparation technologies

adaptation of the EPA toxicity characteristic
leaching process for use with radioactive
samples, char-209, V1: 45; V2: 4

high-pressure ashing for sample preparation,
char-203, V1: 45; V2: 5

metallographic sectioning and preparation,
char-67, V1: 45; V2: 4

microwave digestion, char-19, V1: 45; V2: 4

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V1: 45; V2: 4

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Sampling design technologies

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V1: 45; V2: 3

sampling program configuration management
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**Solid-liquid wastes (inorganic constituents),
characterization alternatives for**

Field methods

atomic emission spectroscopy, char-76,
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X-ray fluorescence for in situ monitoring of
toxic heavy metals, char-219 and char-6,
V1: 49; V2: 14

Laboratory methods

- auger electron spectroscopy, char-2, V1: 50; V2: 15
- atomic emission spectroscopy, char-76, V1: 49; V2: 14
- cold vapor (mercury) analysis, char-24, V1: 49; V2: 15
- electron diffraction, char-37, V1: 49; V2: 14
- electron spectroscopy for chemical analysis, char-1, V1: 50; V2: 15
- energy dispersive X-ray spectroscopy, char-35, V1: 49; V2: 15
- glow discharge ionization mass spectroscopy, char-56, V1: 50; V2: 15
- inductively coupled plasma—mass spectroscopy, char-78, V1: 49; V2: 14
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- neutron activation analysis, char-266, V1: 49, 50; V2: 15
- particle-induced X-ray emission, char-17, V1: 49; V2: 15
- powder X-ray diffraction, char-31, V1: 50; V2: 15
- scanning electron microscopy, char-33, V1: 49; V2: 15
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Solid-liquid wastes (organic constituents), characterization alternatives for

Field methods

- direct sampling ion trap mass spectrometry, char-90, V1: 50; V2: 16
- gas chromatography in the field, char-262, V1: 50; V2: 16
- portable gas chromatograph/electron capture detector for analyzing PCBs, char-100, V1: 50; V2: 16
- portable volatile organic compound detectors, char-5, V1: 50; V2: 16
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Laboratory methods

- analytical methods for chelators and decontamination agents, char-206, V1: 50; V2: 17
- capillary zone electrophoresis, char-207, V1: 50; V2: 17
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- gas chromatography—Fourier transform infrared spectroscopy, char-66, V1: 50; V2: 17
- gas chromatography—mass spectrometry, char-88, V1: 50; V2: 17
- liquid chromatography—mass spectrometry, char-89, V1: 50; V2: 17
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- solid phase microextraction method, char-211, V1: 50; V2: 17

Solid-liquid wastes (pathogenic constituents), characterization alternatives for

Laboratory methods

- pathogen surveillance, char-215, V1: 51; V2: 18

Solid-liquid wastes (physical characteristics), characterization alternatives for

Field methods

- fiber-optic systems for measuring multiple physical variables, char-248, V1: 51; V2: 18
- instrument response models for remote sensing, char-246, V1: 50; V2: 18

Laboratory methods

- computer tomography, char-41, V1: 51; V2: 18
- optical microscopy, char-32, V1: 51; V2: 18
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Solid-liquid wastes (radioactive constituents), characterization alternatives for

Field methods

- advanced radiation monitors, char-269, V1: 48; V2: 12
- alpha track etch detectors for surface alpha contamination, char-96, V1: 48; V2: 12
- bubble dosimeters for neutron flux, char-216, V1: 48; V2: 12
- gamma-ray spectrometry, char-268, V1: 49; V2: 13
- gross fissile analysis by neutron activation and delayed neutron counting, char-200, V2: 13
- integrated microprocessor/sensor monitoring for radioactive waste storage containers, char-250, V1: 47; V2: 12
- long-range alpha detector, char-65, V1: 48; V2: 11
- neutron activation, char-266, V1: 49, 50; V2: 13
- passive monitors for weak beta radionuclides, char-102, V1: 48; V2: 11
- passive neutron detection, char-104, V1: 49; V2: 13
- photon electron rejecting alpha liquid scintillation, char-97, V1: 49; V2: 13
- portable gamma ray scintillometers, char-263, V1: 48; V2: 12
- proportional counter for alpha and beta activity, char-108, V1: 48, 49; V2: 11, 13
- radioanalytical procedures, char-202, V1: 49; V2: 13
- sodium iodide-germanium gamma spectroscopy, char-196, V2: 13
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**Solid-liquid wastes (radioactive constituents),
characterization alternatives for (continued)**

Laboratory methods

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V1: 49; V2: 14

Solid phase microextraction method, char-211,
V1: 50; V2: 17

Solid sorbent sampling for airborne organics,
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**Solid wastes (general problem
areas/constituents), characterization alternatives
for**

Data analysis/management technologies

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V2: 9

application of approximate reasoning to data
analysis/evaluation, char-234, V1: 47;
V2: 8

automated engineering system life cycle plan-
ning, dism-174, V1: 48; V2: 11

automated scanning and conversion of
engineering drawings, dism-154, V1: 47;
V2: 8

automated system reliability and safety
analysis, dism-175, V1: 48; V2: 11

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regulatory guidelines, dism-152, V1: 46;
V2: 7

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computer-aided task analysis and procedure

preparation, dism-172, V1: 47; V2: 9

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V1: 47; V2: 9

criticality indices, char-44, V1: 47; V2: 9

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fiber-optic detection and monitoring system
(intelligent materials), char-240, V1: 48;
V2: 10

generalized object-oriented simulation soft-
ware, dism-173, V1: 48; V2: 11

geographic information system for DOE sites,
dism-181, V1: 47; V2: 8

hazard analysis expert system, char-233,
V1: 47; V2: 8

hypertext information systems, dism-158,
V1: 47; V2: 9

integrated microprocessor/sensor monitoring
for radioactive waste storage containers,
char-260, V1: 48; V2: 10

modeling of volatile organic compounds
migration in porous materials, char-53,
V1: 47; V2: 10

network architecture with integrated

workstations, char-221, V1: 46; V2: 7

project information access services, char-220,
V2: 7

quality control for measurement process,
char-250, V1: 47; V2: 9

simulated walkthrough facility for robotics
task sequence analysis, dism-171, V1: 47;
V2: 8

spatial sample and data analysis plans,
char-253, V1: 47; V2: 9

statistical methods for the analysis of large
data sets, char-251, V1: 47; V2: 9

task scheduling aids, char-241, V1: 47;
V2: 10

3-D CAD data base of buildings and other
structures, dism-156, V1: 48; V2: 10

waste management configuration
management system, char-230, V2: 10

Detection/measurement field methods

air monitoring, char-59, V1: 46; V2: 6

electrochemical methods, char-10, V1: 46;
V2: 6

fiber-optic chemical sensors, char-25, V1: 46;
V2: 5

infrared spectroscopy, char-18, V1: 46; V2: 6

ion mobility mass spectrometry, char-264,
V1: 46; V2: 5

immunoassay detection, char-23, V1: 46;
V2: 5

luminescence detection, char-92, V1: 46;
V2: 6

optical absorption spectroscopy, char-27,
V1: 46; V2: 5

personnel monitoring, char-52, V1: 46; V2: 6

portable Raman spectrometer, char-84,
V1: 46; V2: 5

Detection/measurement laboratory methods

contamination control—analytical equipment,
char-204, V1: 46; V2: 6

Fourier transform infrared spectroscopy,
char-8, V1: 46; V2: 6

isotopic dilution mass spectrometry, char-48,
V1: 46; V2: 7

laser ionization mass spectrometry, char-4,
V1: 46; V2: 7

nuclear magnetic resonance, char-11, V1: 46;
V2: 7

secondary ion mass spectrometry, char-3,
V1: 46; V2: 7

ultraviolet/visible spectroscopy, char-9,
V1: 46; V2: 7

Sample collection technologies

in situ solid phase microextraction of
organics, char-210, V1: 45; V2: 3

membranes for sample collection and
concentration, char-55, V1: 45; V2: 3

multiangle drilling for depth profiling of
contaminants, char-64, V1: 45; V2: 4

sampling and mixing methods, char-81,
V1: 45; V2: 3

sampling heterogeneous wastes, char-270,
V1: 45; V2: 4

sampling interface system for surface
contamination by organics, char-271,
V1: 45; V2: 4

sampling underground storage tanks for volatile organics, char-257, V1: 45; V2: 3
sediment sampling from restricted access locations, char-276, V1: 45; V2: 4
solid sorbent sampling for airborne organics, char-254, V1: 45; V2: 4
ultrasonic extraction, char-20, V1: 45; V2: 3
vacuum-assisted reverse flow, solvent extraction methods, char-62, V1: 45; V2: 3

Sample preparation technologies

adaptation of the EPA toxicity characteristic leaching process for use with radioactive samples, char-209, V1: 45; V2: 4
high-pressure ashing for sample preparation, char-203, V1: 45; V2: 5
metallographic sectioning and preparation, char-67, V1: 45; V2: 4
microwave digestion, char-19, V1: 45; V2: 4
radioactive sample preparation, char-205, V1: 45; V2: 4
supercritical fluid extraction of inorganics, char-201, V1: 45; V2: 5
supercritical fluid extraction of organics, char-208, V1: 45; V2: 4

Sampling design technologies

optimization of sampling designs, char-71, V1: 45; V2: 3
sampling program configuration management system, char-228, V1: 45; V2: 3
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**Solid wastes (inorganic constituents),
characterization alternatives for**

Field methods

atomic emission spectroscopy, char-76, V1: 49; V2: 14
X-ray fluorescence for in situ monitoring of toxic heavy metals, char-219 and char-6, V1: 49; V2: 14

Laboratory methods

atomic emission spectroscopy, char-76, V1: 49; V2: 14
auger electron spectroscopy, char-2, V1: 50; V2: 15
cold vapor (mercury) analysis, char-24, V1: 49; V2: 15
electron diffraction, char-37, V1: 49; V2: 14
electron spectroscopy for chemical analysis, char-1, V1: 50; V2: 15
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Chemical treatment technologies

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