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7. Abstract <i>EW 8/29/94</i> This plan provides the methods used to meet the acceptance criteria required by the 204-AR Waste Recieving Facility.		
<p>8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.</p> <p>PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.</p> <p>DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.</p>		<p>10. RELEASE STAMP</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> OFFICIAL RELEASE BY WHC DATE AUG 30 1994 <i>Sta. 4</i> </div>
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WASTE ANALYSIS PLAN FOR THE 222-S LABORATORY COMPLEX

1.0 FACILITY DESCRIPTION

The 222-S Laboratory Complex, in the southeast corner of the 200 West Area (Figure 1-1), consists of the 222-S Laboratory, the 222-SA Standards Laboratory, and several ancillary facilities. The main facility of the complex consists of the 222-S Laboratory, which provides analytical chemistry and radiological services in support of Westinghouse Hanford Company (Westinghouse Hanford).

Currently, 222-S Laboratory activities are in supporting efforts to characterize the waste stored in the 200 Areas single shell and double shell tanks. Besides this work, the laboratory also provides analytical services for waste-management processing plants, Tank Farms, B Plant, 242-A Evaporator Facility, Plutonium-Uranium Extraction Plant, Plutonium Finishing Plant, Uranium-Oxide Plant, Waste Encapsulation Storage Facility, environmental monitoring and surveillance programs, and activities involving essential materials and research and development.

The 222-SA Laboratory is a modular building located southeast of the 222-S Laboratory. Part of this laboratory prepares nonradioactive standards for the 200 Area laboratories. The other section of the laboratory is used for cold (nonradioactive) process development work and standards preparation.

The 219-S Waste Handling Facility has three storage tanks in which liquid acid waste from 222-S can be received, stored temporarily, and neutralized. From this facility, neutralized waste, containing radionuclides, is transferred to the Tank Farms. A 700-gallon sodium-hydroxide supply tank is also located in this facility.

Figure 1-1 The 222-S Complex

1.1 Containerized Waste

The 222-S Dangerous and Mixed Waste Storage Area located within the 222-S Complex, consists of two metal storage structures approximately 20 feet (6.0 meters) by 8 feet (2.4 meters) by 8.5 feet (2.6 meters). The storage structures rest on a portion of a concrete pad. The doors to the storage units remain locked except during transfers in or out of the structure and during inspections. Typically DOT approved high density polyethylene (HDPE) lined steel 55-gallon drums are used for all wastes, occasionally smaller drums and cardboard containers are also used.

The containers used within the facility for collecting and storing hazardous waste are compatible with the waste stored in them.

2.0 General Waste Analysis

Waste identification occurs in the generating laboratory where specific analytical procedures are conducted in assigned hoods for control of radiation and cross contamination. The chemicals used in a specific hood are well known and seldom changed. Waste stream fact sheets are currently being generated for each analytical procedure. The waste stream fact sheets are written by the chemist or knowledgeable person who authors a particular analytical procedure. The fact sheet will identify the room, hood, procedure number, description of sample, chemical constituents, and radionuclides.

Waste is collected in marked collection containers within laboratory hoods. Chemicals involved in each disposal to a collection container are known through process knowledge, via the fact sheets, or recorded on an inventory sheet when waste is collected from multiple procedures or activities. In the case of discarded chemical products, materials remain in original containers for disposal. The complete waste characterization for the 222-S Laboratory Complex is provided in Chapter 3 of the *222-S Laboratory Complex Dangerous Waste Permit Application*, DOE/RL-91-27.

2.1 222-S Dangerous and Mixed Waste Storage Area

The main source of waste accepted at the 222-S Dangerous and Mixed Waste Storage Area is generated at the 222-S Complex. In addition to this waste, the 222-S Analytical Laboratory accepts unused sample portions back from offsite laboratories for disposal. These unused samples consist mainly of well water and soil samples taken for site characterization. Table 2-1 shows an example of the typical analytical requirements for soil and water samples. The analytical results of these samples are used for waste designation of the samples when they are received at the 222-S Complex and declared waste.

Characterization of the waste generated from the 222-S Analytical and 222-SA Standards Laboratory operations requires identification of physical and chemical properties pertinent to waste disposal and proper waste code designation and classification as a mixed, dangerous, or extremely hazardous waste. After waste characterization, proper procedures for waste handling,

Table 2-1. Typical Analytical Requirements for Soil and Water Samples.

Organic Analytes
Volatile Organic Analysis Semi-Volatile Analysis Pesticides/Polychlorinated Biphenyls Total Organic Carbon
Inorganic Analytes
Anions By Inductively Coupled Plasma Quantameter; (NO ₃ , SO ₄ , PO ₄) Inductively Coupled Plasma Quantameter/ Atomic Absorption Spectrometer metals; (Including bismuth) Total cyanide ⁴ Free cyanide ⁴
Radiochemical Analytes
Total alpha Total beta Strontium-90 Plutonium (By Alpha Energy Analysis) Cobalt-60 Cesium-137 Ruthenium-106

packaging, and labeling are determined, as is the final destination of the waste beyond storage at the 222-S Dangerous and Mixed Waste Storage Area.

The analytical procedures performed in the 222-S Analytical and 222-SA Standards Laboratories are documented and controlled. These analytical procedures are carried out on a routine basis in specifically designated chemical hoods. Therefore, waste generation (and points of generation) is relatively constant. Thus, in nearly all instances, the information needed to adequately characterize the waste is supplied by the generating unit based on process knowledge, manufacturer information (e.g., material safety data sheets), or analytical testing.

3.0 WASTE STREAMS AND SAMPLING PARAMETERS

3.1 Dangerous and Mixed Waste from the 222-S Building

Specific information (process knowledge) is supplied by the generating unit for each waste type prior to storage at the 222-S Dangerous and Mixed Waste Storage Area. Examples of the types of waste generated are presented in Table 3-1. If the hazardous materials control manager believes process knowledge (i.e., accompanying waste documentation) is insufficient to identify the dangerous constituents of the waste, the waste can be sampled at the accumulation area to facilitate timely laboratory analysis. If the hazardous materials control manager confirms process knowledge to be sufficient, waste characterization documentation is completed and submitted to the waste acceptance services. All records providing a description of the waste, dangerous characteristics, basis for waste designation, and laboratory reports with chemical, biological, and physical sample analyses for waste are maintained in the hazardous materials control manager's office or in the 222-S regulatory file at the 222-S Complex.

Waste stored within the Dangerous and Mixed Waste Storage Area is primarily mixed waste generated within the 222-S laboratories, with some dangerous waste coming out of the 222-SA Standards Laboratory. A listing of the different waste streams, parameters and rationale is presented in Table 3.2.

Table 3-1. Types of waste generated at 222-S

WASTE TYPE	SOURCE	DESIGNATION METHOD
Misc. Lead	Broken lead sample containers, flat lead sheets, and lead bricks.	A smear of the lead is taken and tested for radioactivity. If within release limits, the lead is designated "excess" if above limits the lead is designated as extremely hazardous mixed waste.
Laboratory Chemicals	Outdated or off-specification chemicals.	Identified through process knowledge, inventory information, MSDSs, sampling and analysis if information provided is deemed insufficient
Nonradioactive Dangerous	222-SA outdated or off-specification chemicals, some chemicals determined nonradioactive from 222-S Laboratories	Identified through process knowledge, inventory information, MSDSs, sampling and analysis if information provided is deemed insufficient
Liquid Organic	Waste results from radiochemical separation procedures and organic analyses of volatile, semivolatile, pesticide, and polychlorinated biphenyl compounds during daily laboratory operations. Includes scintillation cocktails, discarded environmental and process characterization samples; out dated and off-specification chemical reagents.	Process Knowledge generated from Fact Sheets, MSDSs, analytical procedures

WASTE TYPE	SOURCE	DESIGNATION METHOD
Occasional wastes	Non routine, i.e., waste oil from vacuum pump systems, entrainer units, elevator blower fans, and continuous oilers.	Sampling and Analysis
HEPA Filters	High Efficiency Particulate Air Filters form ventilation systems.	Deemed non-hazardous low-level waste based on past sampling and analysis data, suspect filters are broken down and the filter media sampled and analyzed.

appendix J "Hanford Site Solid Waste Acceptance Criteria" WHC-EP-0063
(current revision)

Table 3-2. Parameters and Rationales for Waste Characterization Documentation for Waste Stored at the 222-S Dangerous and Mixed Waste Storage Area. (2 sheets)

Characterization parameter	Rationale
(1) Chemical Name - International Union of Pure and Applied Chemistry (IUPAC) name and/or common name	Designate waste as Ecology-related Dangerous or extremely hazardous waste by comparison to the "Discarded Chemical Products List" (WAC 173-303-9903) and the "Dangerous Waste Source List" (WAC 173-303-9904).
	Facilitate toxicity calculations using the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances
(2) Toxicity	Determine if a waste is an state only regulated dangerous or extremely hazardous waste as determined from NIOSH Registry of Toxic Effects of Chemical Substances.
(3) Halogenated hydrocarbons	Determine if a waste is an state only regulated dangerous or extremely hazardous waste due to persistence.
(4) Carcinogenicity	Determine if a waste is an state only regulated dangerous waste because of its carcinogenic constituents as determined by the International Agency for Research on Cancer and the Intergrated Risk Information System on Health effects Assessment Summary Table.
(5) Flash Point (ignitability)	Determine conditions of ignitability of waste for proper handling.
	Determine if waste is a U.S. Department of Transportation (DOT)- or RCRA regulated ignitable, flammable, or combustible substance.
(6) pH (corrosivity)	Determine degree of corrosivity of waste for safe handling and treatment and/or packaging requirements. State only and RCRA.
(7) Reactivity	Determine if RCRA regulated
Water Reactivity	Determine if the waste reacts violently with water or produces toxic gases, vapors, fumes, or excessive heat from exothermic reaction with water for the purposes of safe handling and disposal.

Table 3-2. Parameters and Rationales for Waste Characterization Documentation for Waste Stored at the 222-S Dangerous and Mixed Waste Storage Area. (2 sheets)

Characterization parameter	Rationale
Explosivity	Determine if waste is a DOT-forbidden explosive, Class A explosive, or Class B explosive (defined in 49 CFR 173.51, 173.53, or 173.88).
Cyanide and/or Sulfide	To determine if waste, when exposed to corrosive conditions can generate toxic gases, vapors, or fumes.
(8) Toxicity characteristic leaching procedure (TCLP)	Determine if the waste is toxic.
(9) Radioactivity (alpha, beta, gamma)	Determine safe handling, packaging, and disposal requirements.

3.2 Dangerous waste from the 222-SA Laboratory

In the case of waste generated in the 222-SA Standards Laboratory, waste is labpacked in a utility room within the building before being transferred to the 222-S Dangerous and Mixed Waste Storage Area. If the hazardous materials control manager believes process knowledge (i.e., accompanying waste documentation) is insufficient to identify the dangerous constituents of the waste, the waste can be sampled at the accumulation area to facilitate timely laboratory analysis. If the hazardous materials control manager confirms process knowledge to be sufficient, waste characterization documentation is completed and submitted to the waste acceptance services. All records providing a description of the waste, dangerous characteristics, basis for waste designation, and laboratory reports with chemical, biological, and physical sample analyses for waste are maintained in the hazardous materials control manager's office or in the 222-S regulatory file at the 222-S Complex.

4.0 TEST METHODS FOR ANALYZING PARAMETERS

Analytical testing could be required by the hazardous materials control manager or waste acceptance services if generating unit-supplied information does not fully allow for a waste designation to be completed before transport to the 222-S Dangerous and Mixed Waste Storage Area. Not all laboratory analyses are performed at the 222-S Laboratory. Offsite sample analyses are requested through an onsite organization that coordinates sample management.

4.1 SAMPLING METHODS

Representative sampling is required when generating unit-supplied information does not fully characterize the waste. This sampling is requested by the hazardous materials control manager or waste acceptance services and is performed by the hazardous materials control group or an onsite organization specializing in sampling and sample management.

Several waste forms generated at the 222-S Analytical or 222-SA Standards Laboratories might require sampling. Sampling of containerized liquids is performed in accordance with methods prescribed in SW-846 (EPA 1986), using a glass tube thief [WAC 173-303-110(2)(a)(vi) recommends use of a Composite Liquid Waste Sampler (COLIWASA); however, small bottle sizes and limited working space prevent use of a COLIWASA]. The tube thief enables sampling of all stratified layers within a container. Sampling procedures for solid material conform to American Society for Testing and Materials (ASTM) D364-75 using a scoop or tubing. These sampling methods are in accordance with WAC 173-303-110(2). Table 4-1 presents sampling methods used for specific test parameters.

Bottles of unknown or uncertain waste will be opened one at a time under a fume hood located in the laboratory where the unknown waste was found and/or

Table 4-1. Sampling Methods for Waste Stored at the 222-S Dangerous and Mixed Waste Storage Area. (2 sheets)

Test parameter	Sample collection equipment	Sample type	Number of samples	Sample volume	Container type	Test method
Specific Organic Constituents						
Volatile organic compounds	Glass tube thief	Grab	2 samples per drum	40 mL each	Glass, PTFE-lined septum	SW-846, Method 8240
Nonhalogenated volatile organic compounds	Glass tube thief	Grab	2 samples per drum	40 mL each	Glass, PTFE-lined septum	SW-846, Method 8015
Semivolatile compounds	Glass tube thief	Grab	1 per bottle per drum	1,000 mL	Glass or PTFE-lined caps	SW-846, Methods 8250 and 8270
Radionuclides	Glass tube thief	Grab	1 per bottle per drum	100 mL each	Polyethylene or glass	alpha, beta, and gamma
Dangerous waste characteristics						
(1) Ignitability--determined based on analytical data from specific organic constituents tests-- or						
	Glass tube thief	Grab	1 per bottle per drum	50 mL	Polyethylene or glass	SW-846 1010 or 1020
(2) Corrosivity	Glass tube thief	Grab	1 per bottle per drum	500 mL	Polyethylene or glass	WDOE 80-13, Method 1110
(3) Reactivity						
Cyanide	Glass tube thief	Grab	1 per bottle per drum	50 mL	Polyethylene or glass	SW-846, Section 7.3.3.2 with Method 9010

Table 4-1. Sampling Methods for Waste Stored at the 222-S Dangerous and Mixed Waste Storage Area. (2 sheets)

Test parameter	Sample collection equipment	Sample type	Number of samples	Sample volume	Container type	Test method
Sulfide	Glass tube thief	Grab	1 per bottle per drum	50 mL	Polyethylene or glass	SW-846, Section 7.3.4.1 with Method 9030
Explosivity--determined based on analytical data from specific organics constituents tests--						
(4) TCLP	Glass tube thief	Grab	1 per bottle per drum	200 mL	Polyethylene or glass	WDOE 80-13, SW-846 Methods 1311, 6010, 7060, 7195, 7420 and 7470, 8080, 8150
(5) Toxicity--Determined from generating unit supplied information and analytical data-- WAC 173-303-101						
(6) Persistence						
Halogenated hydrocarbons--determined from generating unit supplied information and analytical data-- WAC 173-303-102						
Carcinogenicity--determined from generating unit supplied information and analytical data-- WAC 173-303-103						

mL = milliliter.

SW-846 = EPA 1986.

WDOE 80-13 = Ecology 1982.

TCLP = toxicity characteristics leaching procedure.

generated. The tube thief will be lowered slowly into the waste until the tube contacts the bottom of the waste container. A rubber bulb is attached to the open end. The tube will be withdrawn slowly from the bottle to prevent mixing of stratified layers and loss of sample. The tube will be emptied into a labeled sampling container and the process will be repeated until the necessary volume of sample has been obtained. All necessary personal protective equipment will be worn during sampling activities.

The following guidelines apply to the collection of samples.

- Each bottle (or drum) will be identified by a unique code that will be used consistently to identify the waste container and associated samples (including quality control samples).
- All samples will be recorded in a sampling logbook. Data included will be sample identification code, sample date and time, physical description of the waste, sample method used, and any sampling problems.
- Samples will be labeled with sample date and time, sample collector, drum/bottle code, sample number, preservatives added (if applicable), and requested analyses. Each sample container will be sealed in a plastic bag to prevent cross contamination. Samples will be stored at 4 °C (39.2 °F) until the time of analysis.
- A new glass tube thief will be used for each container of waste. Used glass tubes will either be decontaminated and reused or will be placed with the waste for disposal.
- An analytical request form will be completed and will accompany the samples. This request will specify the sample number, required analyses, date of sample, and routing request for sample information.
- All sampling equipment and sample containers will be handled in accordance with quality assurance and quality control protocols to ensure analytical interference with the chemical composition of the waste is precluded. Appropriate chain-of-custody requirements specified in the *Hanford Analytical Services Quality Assurance Plan* (PNL 1994).

4.2 FREQUENCY OF ANALYSIS

Waste constituents and concentrations are known through process knowledge and chemical manufacturers' information. Each request for sampling and subsequent chemical analysis and radionuclide characterization is considered unique. The need for sampling and analysis is identified by the 222-S hazardous materials control manager or waste acceptance services at the time a disposal request is received.

Many wastes are generated in laboratory hoods from the analytical procedures that are performed. Should analytical procedures performed in the laboratories change, resulting in changes in the generation of waste, process information will be reviewed to see if reagents have changed, the procedure

fact sheet issued with the analytical procedure will be updated and any additional sampling and analytical testing will be performed, if necessary, to adequately characterize the dangerous constituents of the waste.

5.0 ADDITIONAL REQUIREMENTS

5.1 ADDITIONAL REQUIREMENTS FOR WASTES GENERATED OFFSITE

The 222-S Dangerous and Mixed Waste Storage Area does not accept waste generated offsite as defined by WAC 173-040. In addition waste generated outside of the laboratory organization is not accepted for storage at the 222-S Dangerous and Mixed Waste Storage Area. There may be instances where wastes pertaining to treatability studies could be accepted at the 222-S Laboratory Complex. When this occurs the waste will be handled and managed according to WAC 173-303-071(s).

5.2 ADDITIONAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES

Ignitable and reactive wastes are identified at the point of generation using process knowledge. The wastes are then labeled with the appropriate hazard class identification. If process knowledge is not available or insufficient for properly designating the waste a determination of flashpoint of the waste by Pensky-Marten "Closed Cup Test, ASTM D-93-79 will be performed. For reactivity SW-846, method 9010 (or equivalent) for cyanide and SW-846, method 9030 (or equivalent) for sulfide will be used. Based on the dangerous characteristics identified by the waste generating unit, instructions for specific packaging, labeling, and marking are provided by waste acceptance division in the storage/disposal approval record or waste analysis letter.

This waste is separated and protected from sources of ignition or reaction, including but not limited to, open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks, spontaneous ignition (e.g., from heat-producing chemical reactions) and radiant heat. Smoking is banned from all areas within the laboratories and from within 50-feet of the Dangerous and Mixed Waste Storage Area. No smoking signs are in place on the doors to the Dangerous and Mixed Waste Storage Area.

The handling, packaging and storing of ignitable, reactive and incompatible wastes will be conducted in such a way as to prevent the generation of extreme heat or pressure, fire explosion or violent reactions; toxic mists, fumes, dusts or gases in quantities enough to threaten human health or the environment; flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion; damage the structural integrity of the facility or device containing the waste; or through other like means, threaten human health or the environment.

Potentially incompatible waste is packed in separate containers. Dangerous waste is never placed in an unwashed container that previously held

a potentially incompatible waste. A mixture of extremely hazardous waste and dangerous waste is designated as extremely hazardous waste.

Flammable or combustible mixed waste is packaged in nonleaking inner containers and surrounded with absorbent in a minimum 2:1 ratio. Waste that is considered corrosive is packaged in a manner that ensures container integrity. Documentation procedures and waste handling procedures are in compliance with WAC 173-303-395.

5.3 LAND DISPOSAL RESTRICTIONS

Adequate analysis, either through process information reviews or analytical testing, is performed on waste generated at the 222-S Complex to determine land disposal restrictions. All waste stored in the 222-S Dangerous and Mixed Waste Storage Area is transferred to either the 616 Nonradioactive Dangerous Waste Storage Facility or the Hanford Central Waste Complex. Waste transferred to the 616 Facility is documented and shipped offsite to a permitted TSD facility. Land disposal restriction notifications are completed by the 616 Facility and accompany the waste as part of the documentation. Waste transferred to the Hanford Central Waste Complex is placed in long term storage until appropriate treatment and/or disposal technology is developed. Land disposal restriction notifications will be completed by the Hanford Central Waste Complex.

6.0 QUALITY ASSURANCE

QA/QC procedures will be used to ensure that the precision and accuracy of all data generated with respect to the waste being sampled and analyzed is appropriate for the final use of the data. Laboratory analysis at the 222-S Laboratory is done in accordance with *Quality Assurance Program Plan for Laboratory Analyses and Process Testing* WHC-SD-CP-QAPP-003 (WHC1994)

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California Department of Health Services, 1980, A Method for Determining the Compatibility of Hazardous Wastes, Environmental Protection Agency Municipal Environmental Research Laboratory, Cincinnati, Ohio.

WHC, 1989, Hanford Site Radioactive Solid Waste Acceptance Criteria, WHC-EP-0063, Westinghouse Hanford Company, Richland, Washington.

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PNL, 1994, Hanford Analytical Services Quality Assurance Plan, DOE\RL-94-0055 Pacific Northwest Laboratories, Richland, Washington.