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233-S Plutonium Concentration Facility Characterization Plan — Non-Process Areas

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Richland, Washington

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233-S PLUTONIUM CONCENTRATION FACILITY CHARACTERIZATION PLAN – NON-PROCESS AREAS

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ABBREVIATIONS

ACM	asbestos containing material
AHA	activity hazard analysis
AHERA	Asbestos Hazard Emergency Response Act
ALARA	as low as reasonably achievable
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
D&D	decontamination and decommissioning
DQO	Data Quality Objective
DOE	United States Department of Energy
ECOLOGY	Washington State Department of Ecology
EIP	*Environmental Investigations Procedures*
EPA	United States Environmental Protection Agency
ERC	Environmental Restoration Contractor
ERDF	Environmental Restoration Disposal Facility
GEA	gamma energy analysis
HEIS	Hanford Environmental Information System
HEPA	high-efficiency particulate air
HPT	health physics technician
ICP	Inductively Coupled Plasma Spectroscopy
LEL	lower explosive limits
MDC	minimum detectable concentration
MDL	minimum detection limit
MSDS	Material Safety Data Sheet
PCB	Polychlorinated biphenyl
PLM	Polarized Light Microscopy
PPE	personal protective equipment
PQL	practical quantitation limit
PR	plutonium removal
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	Radiation Control Technician
REDOX	reduction-oxidation
RWP	radiation work permit
SWP	special work permit
TCLP	Toxic Characteristic Leaching Procedure
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

The 233-S Plutonium Concentration Facility is to be decommissioned. This Characterization Plan incorporates all items addressed in the *233-S Plutonium Concentration Facility Data Quality Objectives (DQO)* summary (BHI-00832) and provides instruction for obtaining and analyzing samples for waste designation and disposal, in accordance with *Washington Administrative Code* (WAC), Dangerous Waste Regulations, WAC 173-303; *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063-4 (WHC 1993); and the *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, BHI-00139 Rev. 2 (BHI 1996). This plan covers the pipe gallery, control room, equipment room, special work permit (SWP) change room, toilet, electrical cubicle within the 233-S Facility, and the roof over these rooms and over the can storage and loadout rooms (Figure 1). Additional characterization plans will be prepared prior to the start of decommissioning in other areas of the facility.

1.1 FACILITY DESCRIPTION

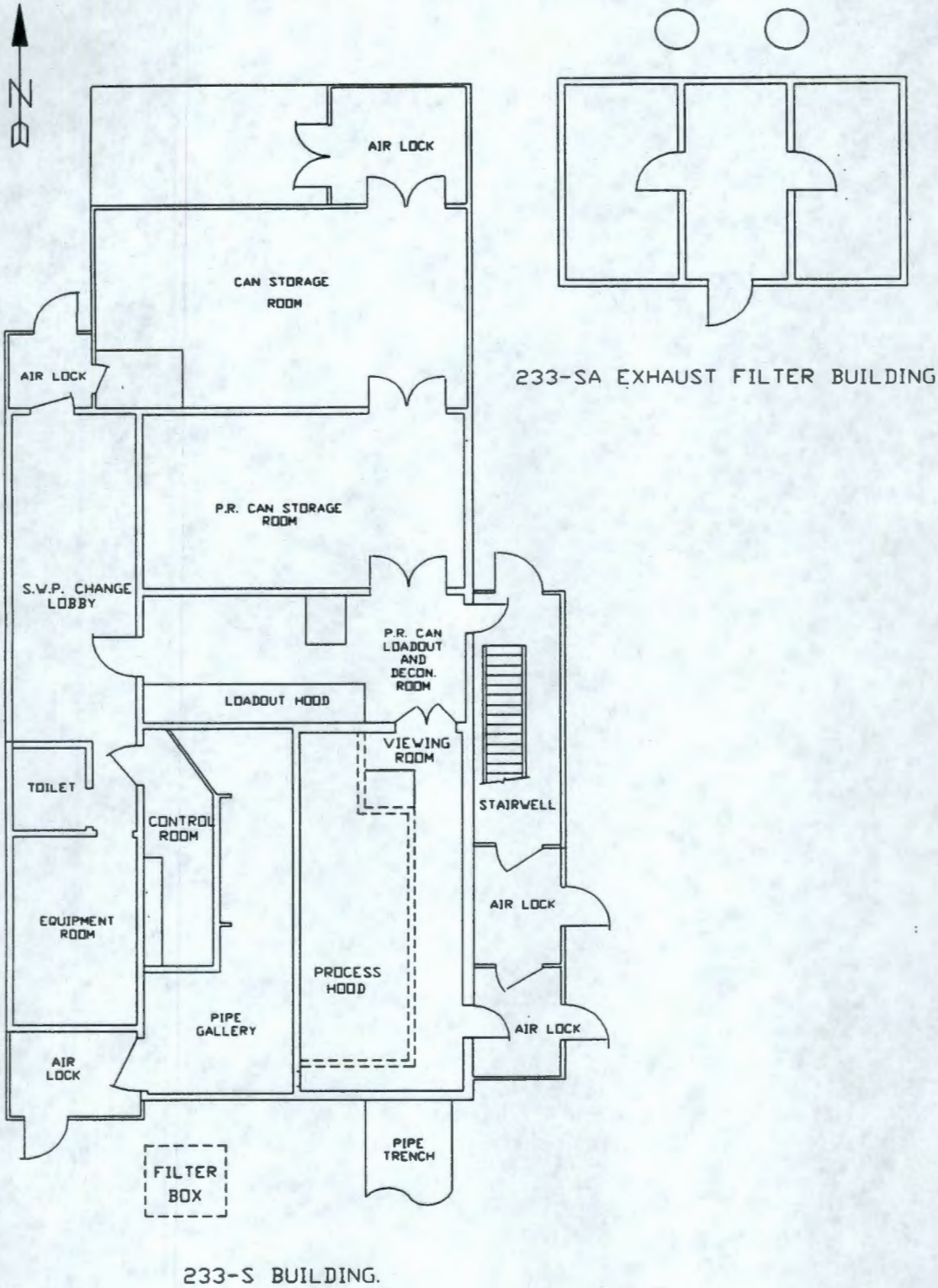
Plutonium was produced by irradiating aluminum clad uranium fuel elements using production reactors located in the 100 Areas of the Hanford Site. After the fuel was irradiated to produce plutonium, the fuel was taken to the separations plants located in the 200 Area, where the aluminum cladding was stripped off the fuel elements and the plutonium extracted. The Reduction-Oxidation (REDOX) Plant was brought on-line in January 1952, to assist this activity. The REDOX Plant was the world's first nuclear solvent extraction plant using the reduction-oxidation process. It operated through July 1967.

The 233-S Plutonium Concentration Facility is located adjacent to, and north of, the REDOX Plant. The facility was used to concentrate the plutonium nitrate product solution from the REDOX facility.

The 233-S Plutonium Concentration Facility is a reinforced-concrete and corrugated metal structure, 26.1 meters (85.5 feet) by 11.3 meters (37 feet), consisting of eight rooms, plus five airlocks and a four-story (9.7 meter [31.8 feet]) high-bay divided into two zones: a process hood and a viewing room partitioned by vertical transparent plastic panels in a steel framework. The process hood contained the criticality safe vessels and piping required to concentrate the plutonium nitrate solution prior to shipment to the Plutonium Finishing Plant (234-5Z).

The 233-S Plutonium Concentration Facility was modified by expansion in 1958. The expansion included the addition of maintenance platforms in the process hood viewing room, an exterior stairwell with airlocks for entry, and an additional plutonium removal (PR) can room. In 1962, an anion exchange purification process in the process hood was installed, vessel and pipe systems were modified, and a plutonium concentrator was converted for neptunium concentration. The 233-SA Exhaust Filter building was added in 1964.

Figure 1. Floor Plan 233-S Facility



In 1956, a flow control valve failure forced a plutonium-nitric acid solution into the valve's air supply line. The solution leaked into the control room through a vent in the air line. About one-half cup of solution leaked out contaminating the control room, the SWP change room, toilet, and the equipment room. The areas were partially decontaminated and the remaining contamination was fixed using several coats of Amercoat #33 (Material Safety Data Sheet [MSDS] in project files) paint. Internals of instruments and electrical equipment were decontaminated to levels less than 40,000 d/m alpha.

A chemical fire in 1963 severely damaged the anion exchange contactor, and the anion exchange purification process was abandoned without equipment removal. The facility was heavily contaminated with alpha contamination (>5 million d/m per 100 cm^2) by the fire. Following an intensive 6-week cleanup, the residual contamination was fixed with paint and the 233-S process was restarted for concentrating and loading plutonium and neptunium products until deactivation in 1967.

In 1978, a major decontamination effort began as preparation to decommission this facility, but stopped in fiscal year 1980 from lack of funds. This activity accomplished initial characterization and housekeeping of the facility and removed the contents of the loadout hood. The contamination within the loadout hood was stabilized and plexiglass panels with high-efficiency particulate air (HEPA) filters were installed to cover the hood doors and other openings. Subsequently, the interior of the loadout hood has been re-contaminated from migration through the previously sealed wall penetrations from the adjoining process hood.

On-going radiological characterization indicates smearable (loose) surface contamination exists in all rooms within the 233-S Building except the change room, equipment room, control room, toilet, can storage rooms, and loading dock. Fixed contamination exists in all areas of the building. Smearable contamination exists in the internals of original equipment, electrical conduits and instruments in all rooms including the control room, SWP change room, toilet, and equipment room.

2.0 OVERALL SCOPE

This characterization plan describes the processes and protocols to be used for identification of radiological and hazardous materials within the pipe gallery, control room, equipment room, SWP change room, toilet, the electrical cubicle in the 233-S Facility, the roof over these rooms and over the can storage and loadout rooms. This plan identifies where and how samples will be collected and analyzed. The information obtained will be used for waste designation, segregation, and disposal, and may be used for planning purposes.

3.0 DELIVERABLES

The final analysis report will be the major deliverable from the results of this Characterization Plan.

3.1 RESPONSIBILITIES

This section identifies the responsibilities of various organizations supporting the characterization effort. Several organizations have duplicate responsibilities because the project team may use one or the other, or both, groups during the characterization, based upon personnel availability and training/medical qualifications.

3.1.1 Decontamination and Decommissioning Engineering

- Prepare the Characterization Plan.
- Arrange sampling and analysis activities.
- Oversee sampling activities.
- Interpret analytical data.
- Prepare final characterization report.

3.1.2 Sample Management

- Arrange for laboratory analysis of samples.
- Receive data packages from the laboratory.
- Provide Hanford Environmental Information System (HEIS), numbers for sample identification, if required.
- Provide laboratory data package.

3.1.3 Special Analytical Services

- Arrange for laboratory analysis of samples.
- Perform laboratory analysis of samples, as requested.
- Provide sample identification numbers.
- Receive data packages from the laboratory.
- Provide laboratory data package.

3.1.4 Field Sampling Personnel

- Perform sampling and field screening.
- Document sampling activities in a controlled log book.
- Initiate chain of custody documentation for samples.
- Package and ship samples to laboratory.
- Transport samples to the laboratory or shipping center.

3.1.5 Environmental Restoration Contractor Field Support

- Prepare work packages to support the sampling team.
- Conduct and document pre-job meetings when supporting the sample team.
- Provide field support to the sampling team.
- Provide coordination with other site organizations (Radiation Control, Safety, etc.) to support sampling team.

3.1.6 Industrial Safety

- Provide industrial safety support and monitoring for the sampling team.
- Provide the approved Activity Hazard Analysis (AHA).

3.1.7 Radiological Control Personnel

- Provide radiation control coverage for the sampling team.
- Provide dose rate data for sample shipping.
- Recommend as low as reasonably achievable (ALARA) actions.
- Provide the radiation work permit (RWP[s]).
- Conduct radiological surveys.

3.1.8 Environmental Restoration Contractor Quality Assurance/Quality Control

- Conduct random surveillances to verify compliance with requirements of this plan.

4.0 SAFETY

The personal protective equipment (PPE) to be worn during sampling shall be listed on the job-specific AHA and RWP as required.

5.0 MEETINGS, REPORTS AND ACTIVITIES

Prior to each day's sampling effort, pre-job meetings shall be conducted to discuss the work to be performed, AHA, RWP and PPE requirements. This meeting shall be documented by Field Support. As a minimum, the following personnel shall attend the pre-job briefings and the plan-of-the-day meetings:

- Decontamination and Decommissioning (D&D) Workers
- Radiation Control Technicians (RCTs)
- D&D Supervisor
- RCT Supervisor
- Samplers

Also, the following personnel shall attend the pre-job briefings and should attend the plan-of-the-day meetings:

- D&D Superintendent
- Industrial Safety
- Field Support Engineer
- D&D Engineer(s)
- Rad Engineer
- D&D Characterization Engineer
- Industrial Hygiene
- Waste Management

6.0 SAMPLING

6.1 RADIOLOGICAL SURVEYS AND SMEARS

All areas addressed in this characterization plan will require radiological surveys including obtaining smears. All radiological surveys shall follow the guidelines given in BHI-SH-04, *Radiological Work Instructions Manual.*

6.2 SAMPLE LOCATIONS

Based on the facility walkdown, historical documentation (Table 1) and the DQO process, the following sample points have been identified for sampling during this portion of the project:

- Oil sample - A composite oil sample will be collected from oil/grease reservoirs on the fans and motors in the equipment room and from the pump for the L-1-A tank in the pipe gallery.

Table 1. Historical Documents

Document #	Rev. #	Name	Author(s)	Date
BHI-00749	0	Passive Neutron Survey of the 233-S Plutonium Concentration Facility	Scientific Ecology Group - J.P. Gonsky	Nov-95
72740-80-182		Meeting Soil Standards for Release of 233-S Building	D. Bihl to D. C. Shoemaker	Apr-80
ARH-780		Chronological Record of Significant Events in Separations Operations	R. W. McCullugh, J. R. Cartmell	Aug-68
BHI-00066		Hanford Surplus Facilities Hazards Identification Document	R. G. Egge	Nov-94
BHI-00550	0	Sample Collection and Sample Analysis Plan in Support of 202-S REDOX Sample Galleries and Hot Shop Isolation Activities	R. A. Harris	Jan-96
BNWL-10011 Parts 1 & 2		Fire Incident 233-S Facility		Nov-63
D0104ER0102	0	Pre-D&D Radiological Survey Report (233-S Dismantling)	J. H. Hummer	Nov-78
D0104WP0101	0	Initial Facility Characterization: Radiological Procedure	J. H. Hummer	Jun-78
D0104WP0104	A	Nondestructive Assay of 233-S Exhaust Ventilation System Procedure	D. C. Shoemaker	Jan-79
DOE/RL-94-107	1	Radioactive Air Emissions Program Notice of Construction for the Decommissioning of the 233-S Plutonium Concentration Facility Complex		Oct-94
EGG-10617-1062		An Aerial Radiological Survey of the Hanford Site and Surrounding Area		Jul- & Aug-88
EGG-1183-1828		An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site		Sep-82
HW-59644		Redox In-Line Monitoring Instruments Information Manual	O. D. Erlandson	Mar-59
HW-68357		Revised Requirements for Continuous Birch Recovery at Redox	R. G. Barnes	Feb-61
HW-70728		Measurement Procedures for Purified Birch	J. S. Buckingham	Aug-61
Instruction # 6.1.1 Redox Deactivation		Vessel and Piping - Terminal Processing	C. B. Foster	Jun-66
ISO-SA-35		Decontamination of Plutonium Concentration Building	R. G. Zumhuff	Mar-67
PNL-SA-7401		The 1976 Hanford Americium Accident	K. R. Heid, B. D. Breitnstein, H. E. Palmer, B. J. Mcm	Jan-79
Rad Survey #178593		H. P. Coverage of Port Cover Change on Process Hood (L-18) 233-S	B. M. Biever	Jun-94

Table 1. Historical Documents (Continued)

Document #	Rev. #	Name	Author(s)	Date
RHO-SA-187		Decontamination of the 233-S Building Loadout Hood	D. C. Shoemaker; A. W. Graves	
SD-DD-FL-001	0	Rockwell Retired Contaminated Facility Listing and Description	A. A. Crusselle, T. Romano	Jul-82
SD-DD-TI-028	0	Physical Status and Post Stabilization Activities Report for the 233-S Building	J. F. Beckstrom	May-88
TID-26506		The Kinetics of the Oxidation-Reduction Reactions of Uranium, Neptunium, Plutonium and Americium in Aqueous Solutions	T. W. Newton	1975
WHC-EP-0646		Characterization of Past and Present Solid Waste Streams from the Plutonium-Uranium Extraction Plant	D. R. Duncan	Apr-93
WHC-SD-CP-TI-163	0	Radiological Characterization of 233-S Facility	V. B. Subrahmanyam	Oct-90
WHC-SD-DD-TI-056	1	233-S Facility Potential Chemical Hazards	G. J. Carter, Jr.	Jun-93
WHC-SD-EN-SAD-029	0	Safety Assessment for 233-S Plutonium Concentration Facility Characterization/Verification Activities	J. A. Locklair	Mar-94
		233-S Plutonium Concentration Building	M. S. Gerber	Dec-93
		Protection and Management of Plutonium	ANS Special Panel Report	Aug-95
		Plutonium Handbook: A Guide to Technology – Volumes 1 & 2	O. J. Wick	1980
Rad Survey #178720		HPT Coverage SWP Change Room, Toilet, Equipment and Control	S. Sikes, B. Hitzer, L. Lawing	Jun-94
Rad Survey #PS-233S-0197		3rd Airlock Walking South from Bottom Stairwell	J. Lawing	Jan-95
Rad Survey #PS-233S-0198		233-S Stairwell Characterization, Second Airlock	J. Tufford	Jan-95
Rad Survey #PS-233S-0255		Bottom Stairway After Vacuum Area	K. Lawing	Feb-95
Rad Survey #PS-233S-0305		Stairs 2nd, 3rd and Top Floor Before and After Decon	K. Lawing	Feb-95
Rad Survey #PS-233S-0285		Stairwell	S. Huddleston	Feb-95
Rad Survey #PS-233S-0673		1st Floor Viewing Room	S. Huddleston	May-95
Rad Survey #PS-233S-0680		Loadout/Decon Room	K. Lawing	May-95
Rad Survey #PS-233S-1192		Loadout Room and Stairwell	K. Lawing	Dec-95
Rad Survey #PS-233S-1247		Viewing Room, 1st Floor	S. Huddleston	Dec-95
D0104WP0401	0	Pipe Gallery Characterization Procedure	B. C. McClelland	Nov-79

- Oil/grease samples will be obtained by removing drain or fill plugs from the equipment. If oil will freely drain, the sample will be collected in a sample bottle. If the oil does not freely drain, a peristaltic pump, coliwassa tube, eye dropper, syringe, scoopla, or similar device will be used to collect a sample. In collecting the composite sample, the approximate ratios of sample size to equipment reservoir sizes will be maintained. But, if the equipment was previously drained, there may be insufficient material to obtain a sample.

- The L-1-A tank heel, and the associated piping in the pipe gallery that contained nitric acid solution, will be sampled.

  - It will be determined if a heal exists by looking into the tank via the manhole.

    CAUTION: Do not allow any part of observer to enter tank without first sampling the atmosphere. If a heal or crystals are present, a sample will be obtained by reach pole, peristaltic pump (liquids), "clam shell" sampler (solids/sludge) or "hot tap" to tap the piping for liquid/crystals/sludge samples.

- Suspect asbestos containing materials (ACM) in each room and on the roof will be sampled. A good faith asbestos inspection will be performed by a certified Asbestos Hazard Emergency Response Act (AHERA) Building Inspector to identify all suspect ACM in the pipe gallery, control room, SWP change room, equipment room, toilet, electrical cubicle and roof. Bulk samples will be obtained to confirm the presence or absence of ACM in identified areas, and analyzed in accordance with the United States Environmental Protection Agency (EPA) 560/5-85-030a, *Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials.* All samples will be analyzed using Polarized Light Microscopy (PLM).

  Note: *For ALARA purposes, an alternative would allow a certified AHERA Building Inspector to perform a good faith inspection and all suspect ACM identified would be treated as asbestos.*

- A composite paint sample will be obtained from each room (pipe gallery, control room, SWP change room, equipment room, toilet, and electrical cubicle). Each sample will consist of paint collected/scraped off the floor, each wall, the ceiling, and off equipment and conduit that has been painted to fix contamination. A total of six samples will be collected. Only the sample from the pipe gallery will be analyzed for the full set of radionuclides listed in Table 2. The other five samples will have gamma energy analysis (GEA), and gross alpha and gross beta analysis performed on them. This isotopic distribution of the pipe gallery would be applied to these paint samples, as appropriate.

  - A knife, spatula, paint scraper or similar device will be used to collect paint samples. Samples will be collected from areas of highest fixed contamination and from each different paint type (color) for each area. Paint samples should be collected such that the radioactivity in the paint is biased high. This will allow easier detection of hard to detect radionuclides (less prevalent). Radiological surveys of the area will allow the ratioing of radioactivity if the paint samples would put the waste into a higher waste classification.

Table 2. 233-S Plutonium Concentration Facility — Non-Process Areas Sample Requirements.

233-S PLUTONIUM CONCENTRATION FACILITY	RAD ANALYSIS												CHEMICAL ANALYSIS								
	GEA					Other							Metals			Others					
Sample Point	Gross Alpha	Gross Beta	Cobalt-60	Cesium- 137	Other Detectable Isotopes	Plutonium-238	Plutonium-239	Plutonium-240	Plutonium-241	Americium-241	Neptunium-237	Curium-244	TCLP Extraction	ICP Metals (TAL)	Mercury	Organics	Polychlorinated Biphenyls	Anions	pH	Asbestos	Comments
Oil in Pumps / Fans	X	X	X	X	X								X	X	X	X	X				Composite
L-1-A Tank & Piping	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X		
Pipe Gallery Paint	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						Composite
Control Room Paint	X	X	X	X	X								X	X	X						Composite
SWP Change Room Paint	X	X	X	X	X								X	X	X						Composite
Equipment Room Paint	X	X	X	X	X								X	X	X						Composite
Toilet Paint	X	X	X	X	X								X	X	X						Composite
Electrical Cubicle Paint	X	X	X	X	X								X	X	X						Composite
Floor Drains	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						Composite
Steam Lines	X	X	X	X	X								X	X	X			X			
Electrical Conduit (Tech. Smears)	X	X	X	X	X																
Instruments on Control Panel (Tech. Smears)	X	X	X	X	X																
Instrument / Control Air Lines (Tech. Smears)	X	X	X	X	X																
Piping Low Pts / Liquid Collection Pts.	X	X	X	X	X								X	X	X				X		Min. Analytes. 8 Samples Max.
Roof Samples (2)	X	X	X	X	X	X	X	X	X	X	X	X								X	Composites
Suspect Asbestos Material	X	X	X	X	X															X	

- The drain line in the floor located near the L-1-A tank in the pipe gallery will be sampled. Per drawing number H-2-45607, the floor drain was plugged with a 3½ inch diameter by 1/4 inch thick carbon steel disc and then filled with a non-shrink grout. The plug is to be removed and then, upon completion of sampling, reinstalled or a new plug will be used. This drain line flows to the north and connects to the chemical sewer line.

  CAUTION: Upon plug removal and prior to sampling, verify the atmosphere in the drain lines is below the lower explosive limits (LEL).

  - If liquid is present based on visual observation, a liquid sample will be obtained by using a dipper, peristaltic pump, eye dropper, etc. If sludge is present, a spoon, scoop, trowel, thief, etc., will be used to obtain a sludge sample. If no sludge is present, a spoon, spatula, paint scraper, etc., will be used to collect scale/rust from the pipe surfaces.

- The drain line in the equipment room floor will be sampled. The line has been plugged, in the same way as the floor drain by the L-1-A tank, and will require removal of the plug prior to sampling. Upon completion of sampling, a new plug will be reinstalled. This drain line, as well as the floor drains in the toilet and SWP change room, flows to the south and connects with the 6-inch sewer line running along the north side of 202-S.

  CAUTION: Upon plug removal and prior to sampling, verify the atmosphere in the drain lines is below the lower explosive limits (LEL).

  - If liquid is present based on visual observation, a liquid sample will be obtained by using a dipper, peristaltic pump, eye dropper, etc. If sludge is present, a spoon, scoop, trowel, thief, etc., will be used to obtain a sludge sample. If no sludge is present, a spoon, spatula, paint scraper, etc., will be used to collect scale/rust from the pipe surfaces.

- The steam lines in the pipe gallery will be checked for free liquids and the liquid sampled, if present. If no liquids are present, the sample will consist of pipe scale collected from inside the piping.

  - The low point drain will be opened and any free liquid that may be present will be collected. If no liquid is present, a spatula, spoon, knife, etc., will be used to collect scale from the piping. If necessary, a pipe connection or flange will be broken to obtain better access to the internals of the pipe. Steam traps may also be opened to collect a scale sample.

- Electrical junction boxes will be opened and surveyed in each room. If contamination is identified, a technical smear will be collected and analyzed. Only

the smear with the greatest amount of contamination from each room will be analyzed.

CAUTION: Confirm all lines are de-energized prior to entry into the junction boxes.

- Electrical Junction Boxes: A health physics technician (HPT) will obtain a technical smear per BHI-SH-04, *Radiological Work Instructions Manual.*

- Control panel instruments will be surveyed from the most accessible side (pipe gallery or control room) using hand-held instruments. A technical smear shall be obtained from the instrument with the greatest amount of contamination.

  - Control Panel Instruments: A HPT will obtain a technical smear per BHI-SH-04, *Radiological Work Instructions Manual.*

- Instrument and control air-lines will be surveyed and checked for internal contamination. If internal contamination is found, a technical smear shall be obtained and analyzed. The internally contaminated lines shall be marked/identified so that proper precautions can be taken when decommissioning the facility.

  - A HPT will obtain a technical smear per BHI-SH-04, *Radiological Work Instructions Manual.*

- Low points and liquid collection points of each system will be verified dry. If liquids are present, samples will be obtained. The systems present in the pipe gallery are: steam, demineralized water, raw water, inert gas, instrument air, drains, chemical process, vacuum, and exhaust and vent.

  - Verification that there are no liquids will be obtained by opening drain valves, breaking open flanges/pipe connections or hot tap, if necessary. If no liquids are present, an inspection for indications of crystalline material or discolored scale will be performed. Samples will be obtained with a spoon, spatula, scraper, etc., if discoloration/crystalline materials are present.

    NOTE: *ERC does not expect to find any liquids in the piping systems within the non-process pipe gallery because these systems were previously characterized in 1979 per procedure D0104WP0401, "Pipe Gallery Characterization Procedure."*

    NOTE: *Table 2 identifies the sample points and analysis to be performed on each sample. The HPT will use hand-held survey instruments to identify the areas of highest radioactivity/contamination. These areas shall be documented on survey forms and a copy of the surveys given to the 233-S Facility Characterization Team Lead.*

6.3 SAMPLE IDENTIFICATION

The key element in sample identification is to ensure the unique sample number is accurately cross referenced to the sample location and description. This information shall be recorded in the field log book.

Sample labels shall be furnished by the sampling personnel. The sample labels will require the following information to be recorded by a member of the sampling team:

- Identification of the person collecting the sample
- A unique sample identification number
- Date and time the sample was collected
- The type of preservative (if required) added to the sample bottle or "no preservative."

Each sample bottle shall be identified with a bar code sticker attached to the bottle by the bottle manufacturer. The bar code shall identify the bottle lot number and individual bottle number.

6.4 SAMPLING EQUIPMENT

The sampling equipment that comes into contact with the sample (i.e., scoops, paint scrapers, spoons, trowels, pliers, forceps, tongs, etc.) will be cleaned to SW-846, *"Test Methods for Evaluating Solid Waste Physical/Chemical Methods"* (EPA 1994), protocols.

The following tools/equipment should be available for sampling: paint scrappers, hammer and chisel, spatulas, various sizes of eyedroppers/turkey basters, hand-held drill, adjustable wrench, spoons, technical smears, peristaltic pump and tubing, cork borer or core tool for asbestos samples, plastic bags (various sizes), flash light, duct tape, marking pens, absorbent cloth/paper towels, labels, screw driver, camera and film, and wire cutters. This is a suggested list of sampling equipment that should be available during the sampling effort; however, it is not an all inclusive list.

6.4.1 Sample Containers

Samples shall be collected in commercially available, individually certified, EPA Level I, pre-cleaned bottles. The certification of the pre-cleaned condition shall be maintained on file by the Sampling Team.

6.5 SAMPLE HANDLING

The collection, handling, and preparation of samples shall comply with the protocols of "Test Methods for Evaluating Solid Waste Physical/Chemical Methods," SW-846. The chain of custody shall comply with BHI-EE-01, *Environmental Investigations Procedures*, EIP 3.0, "Chain of Custody." A chain of custody form will be filled out at the time of sampling and shall accompany each sample to the laboratory. A sample may consist of several containers. The chain of custody will account for each container. Preparation of samples for shipment shall comply with BHI-EE-01, EIP 3.1, "Sample Packaging and Shipping."

7.0 SAMPLE ANALYSIS

Samples will be analyzed for the constituents of concern as listed in Table 2. Requested analysis shall be recorded on the chain of custody that accompanies each sample to the laboratory. (See Table 3 for analysis method, holding times, sample volumes and preservation requirements).

Sample volumes may be insufficient to perform all the analyses requested. Priority of analysis shall be:

1) Activity Scan (for shipping samples and determination if laboratory must handle the sample as radioactive),
2) Gross Alpha,
3) Gross Beta,
4) GEA,
5) Toxic Characteristic Leaching Procedure (TCLP)/Inductively Coupled Plasma Spectroscopy (ICP) Metals (total metals may be performed if sample size is insufficient for TCLP extraction),
6) Mercury, then for oil/grease sample,
7) Polychlorinated biphenyls (PCBs),
8) Organics.

For all other samples remaining, analytes per laboratories choice.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

Surveillance and assessments will be performed by the QA Department in compliance with the Quality Assurance (QA) Program as referenced in the ERC Quality program (BHI-QA-01 Revision 0, *ERC Quality Program*).

Table 3. Requested Laboratory Analysis

Reference Method	Analyte of Interest	Sample Container/Volume Solids		Sample Container/Volume Liquids		Preservation Method	Required Detection Limit ($\mu g/\ell$)	Laboratory Detection Limits					
								Lab #1		Lab #2		Lab #3	
		Full	Min	Full	Min			Water	Solid	Water	Solid	Water	Solid
Anions, EPA 300.0	Chloride, 12595-89-0	P/G40 g	10 g	P/G300 mℓ	100 mℓ	Cool to 4 degrees C	150.0	—	—	1.0	—	180.0	—
	Phosphorus, 14265-44-2						500.0	—	—	1.0	—	139.0	—
	Nitrite, NO2-N						150.0	—	—	0.5	—	7.4	—
	Nitrate, NO3-N						150.0	—	—	0.5	—	8.1	—
	Sulfate, 14808-79-8						150.0	—	—	1.5	—	42.9	—
	Fluoride, 16984-48-8						100.0	—	—	—	—	10.4	—
	Bromide, 24959-67-9						150.0	—	—	0.5	—	19.2	—
Physical Characteristics								PQL		PQL		MDL	
EPA 9040, 9045	pH	P/G10 g	5 g	P/G100 mℓ	50 mℓ	Cool to 4 degrees C	±0.05	—	—	0.01 pH	0.01 pH	—	—
Indicator Parameters													
EPA 9020	Total Organic Ha ides (TOX), TOX	aGs20 g	4 g	aGs3x250 mℓ	200 mℓ	H_2SO_4 to pH<2; Cool to 4 Degree C	10.0	0.04	—	0.005	50.0	13.9	—
Metals								PQL		PQL		IDL	
EPA 6010A	Aluminum, 7429-90-5	P/G15 g	4 g	P/G500 mℓ	300 mℓ	HNO_3 to pH<2	100.0	0.2	40.0	200.0	20.0	18.2	—
	Antimony, 7440-36-0						100.0	0.06	12.0	60.0	6.0	24.6	—
	Barium, 7440-39-3						10.0	0.2	40.0	200.0	20.0	0.6	—
	Beryllim, 7440-41-7						2.0	0.005	1.0	5.0	0.5	0.5	—
	Calcium, 7440-70-2						10.0	5.0	1000.0	5000.0	500.0	10.6	—
	Cobalt, 7440-48-4						20.0	0.05	10.0	50.0	5.0	12.2	—

* Liquids only, for solids cool to 4 degree C

Table 3. Requested Laboratory Analysis (Continued)

Reference Method	Analyte of Interest	Sample Container/Volume Solids		Sample Container/Volume Liquids		Preservation Method	Required Detection Limit ($\mu g/\ell$)	Laboratory Detection Limits					
								Lab #1		Lab #2		Lab #3	
		Full	Min	Full	Min			Water	Solid	Water	Solid	Water	Solid
EPA 6010A (cont.)	Copper, 7440-50-8						20.0	0.025	5.0	25.0	2.5	2.2	—
	Iron, 7439-89-6						30.0	0.1	20.0	100.0	10.0	18.9	—
	Magnesium, 7439-95-4						100.0	5.0	1000.0	5000.0	500.0	15.6	—
	Manganese, 7439-96-5						5.0	0.015	3.0	15.0	1.5	0.8	—
	Nickel, 7440-02-0						25.0	0.04	8.0	40.0	4.0	7.1	—
	Potassium, 7440-09-7						1000.0	5.0	1000.0	5000.0	500.0	368.9	—
	Silver, 7440-22-4						10.0	0.01	2.0	10.0	1.0	2.6	—
	Sodium, 7440-23-5						300.0	5.0	1000.0	5000.0	500.0	22.8	—
	Tin, 7440-31-5						100.0	0.2	40.0	100.0	10.0	51.3	—
	Vanadium, 7440-62-2						10.0	0.05	10.0	50.0	5.0	5.5	—
	Zinc, 7440-66-6						10.0	0.02	4.0	20.0	2.0	2.1	—
EPA 7131	Cadmium, 7440-43-9	P/G15 g	4 g	P/G500 mℓ	300 mℓ	HNO_3 to pH<2	5.0	0.005	1.0	1.0	0.1	2.6	—
EPA 7191	Chromium, 7440-47-3						10.0	0.01	2.0	5.0	0.5	3.6	—
EPA 7060	Arsenic, 7440-38-2						5.0	0.01	2.0	10.0	1.0	1.6	—
EPA 7421	Lead, 7439-92-1						5.0	0.003	0.6	3.0	0.3	1.5	—
EPA 7740	Selenium, 7782-49-2						5.0	0.005	1.0	5.0	0.5	1.8	—
EPA 7841	Thallium, 7440-28-0						5.0	0.01	2.0	10.0	0.1	1.4	—
EPA 7470, 7471	Mercury, 7439-97-6	G15 g	4 g	G500 mℓ	300 mℓ	HNO_3 to pH<2	0.2	0.0002	0.1	0.2	0.1	0.2	—

* Liquids only, for solids cool to 4 degree C

Table 3. Requested Laboratory Analysis (Continued)

Reference Method	Analyte of Interest	Sample Container/Volume Solids		Sample Container/Volume Liquids		Preservation Method	Required Detection Limit (µg/l)	Laboratory Detection Limits					
								Lab #1		Lab #2		Lab #3	
		Full	Min	Full	Min			Water	Solid	Water	Solid	Water	Solid
Polychlorinated Bi-Phenyls by GC								PQL		PQL		MDL	
EPA 8080A	Aroclor-1221, 11104-28-2	aG120g	30g	aG2000 mℓ	1000 mℓ	Cool to 4 degree C	0.5	2.0	67.0	1.0	33.0	—	—
	Aroclor-1232, 11141-16-5						0.5	1.0	33.0	1.0	33.0	—	—
	Aroclor-1242, 53469-21-9						0.5	1.0	33.0	1.0	33.0	—	—
	Aroclor-1248, 12672-29-6						0.5	1.0	33.0	1.0	33.0	—	—
	Aroclor-1254, 11097-69-1						0.2	1.0	33.0	1.0	33.0	—	—
	Aroclor-1260, 11096-82-5						0.2	1.0	33.0	1.0	33.0	0.02	1.96
Radionuclides								MDA		MDA			
AM-241	Americium-241, 14596-10-2	P/G6 g	2 g	P/G600 mℓ	200 mℓ	HNO_3 to pH<2	1 pCi/g	0.1	0.1	0.59	0.08	—	
GAMMA	Americium-241	P/G1500 g	500 g	P/G2250 mℓ	1000 mℓ	HNO_3 to pH<2	0.4pCi/g	—	—	—	—	—	
	Cesium-137, 10045-97-3						0.1 pCi/g	—	—	9.77	0.01	—	—
	Cobalt-60, 10198-40-0						0.05pCi/g	—	—	9.48	0.01	—	—
	Np-237						0.1 pCi/g		—	44.28	0.07	—	—
AEA	Plutonium-238, 239/240	P/G6 g	2 g	P/G600 mℓ	200 mℓ	HNO_3 to pH<2	1 pCi/g	—	—	0.59	0.06	—	—
	Pu-241 (Liquid Scintillation)						1pCi/g						
	Np-237						1 pCi/g	0.1	0.1	0.59	0.06	—	—
	Am-241						1 pCi/g						
	Cm-244						1 pCi/g						
GA	Gross Alpha, 12587-46-1	P/G2 g	1 g	P/G600 mℓ	200 mℓ	HNO_3 to pH<2	5 pCi/g	2.0	5.0	2.21	8.85	—	—
GB	Gross Beta, 12587-47-2	P/G2 g	1 g	P/G600 mℓ	200 mℓ	HNO_3 to pH<2	10 pCi/g	4.0	10.0	3.5	9.9	—	—

* Liquids only, for solids cool to 4 degree C

8.1 FIELD LOGBOOK

All sampling activities will be documented in controlled field logbooks in accordance with BHI-EE-01, EIP 1.5, "Field Logbooks." Field logbooks shall include, but are not limited to, the following:

- Names of all field sampling, operations, ERC, and health physics personnel participating in the sampling and their responsibilities
- Photographs and/or sample location diagram(s)
- Date and time the sample was collected
- Table correlating sample identification numbers to sample locations and any quality control (QC) samples
- Lot number(s) of the bottles used to collect samples
- Any pre-job meetings held for the sampling event(s)
- Sampling methods and procedures used
- Field problems, solutions and corrective actions
- Audits/Surveillances conducted during the sampling event

The logbook entries and sample summary shall be reviewed and signed off by the sampler. Photocopies of the field logbook entries shall be forwarded to the 233-S Facility Characterization Team Lead upon completion of the sampling event.

8.2 QA/QC SAMPLE ANALYSIS

An EPA analytical method, or equivalent, shall be used whenever possible. If an EPA method cannot be followed for radiological or ALARA purposes, it shall be documented and explained in the analytical results. If sample sizes are reduced, ratios between sample size and reagents shall be maintained. Laboratory QC samples shall follow the requirements for QC in each specific SW-846 procedure followed. Field QC Samples will not be obtained because it will be difficult to obtain enough volume to perform all the requested analyses with the initial sample and because all sample points will be biased to the highest suspected concentrations of the analytes. Sample results will be evaluated on a go/no-go basis.

QC standards shall be analyzed prior to the analysis of collected samples. The results of QC standards shall be documented on the data report. At a minimum, one out of every twenty analysis samples shall be performed in duplicate.

9.0 REPORTING

9.1 ANALYTICAL RESULTS

Initial analytical results shall be faxed to the 233-S Facility Characterization Team Lead, once the analysis has been completed. A data report containing sample analysis results and QC sample results validated to summary level per BHI-EE-01, *Data Package Validation Process*, shall be forwarded to the 233-S Facility Characterization Team Lead after they have been reviewed and validated. Results will be returned in both hard copy and electronic copy.

The analytical laboratory shall provide the 233-S Facility Characterization Team Lead a case narrative of the sample analyzed. This case narrative shall include the following:

- Sample Identification Number.
- Results of the analysis including the percent error and the Minimum Detectable Concentration (MDC) at the 80% confidence level.
- How the sample was analyzed.
- Any anomalies encountered during sample analysis.

10.0 WASTE GENERATION

If hazardous waste is generated during sampling activities, it shall be handled according to waste handling procedures of BHI-FS-01, *Field Support Administration*, Section 4.0, "Waste Management." As investigation derived waste per previous agreements between the United States Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology) and the United States Department of Energy (DOE), waste will be disposed of in the Environmental Restoration Disposal Facility (ERDF), provided that it satisfies the waste acceptance criteria. Waste that does not meet the waste acceptance criteria shall be treated accordingly and disposed of in the ERDF or handled in a manner agreed upon by both EPA and DOE.

11.0 REFERENCES

BHI, 1996a, *233-S Plutonium Concentration Facility Data Quality Objectives*, BHI-00832 Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1996b, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, BHI-00139 Rev. 2, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-01, *Environmental Investigation Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-FS-01, *Field Support Administration*, Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-01, *ERC Quality Program*, Bechtel Hanford, Inc., Richland, Washington.

EPA, 1994, *Test Methods for Evaluating Solid Waste*, SW-846, Third Edition and revisions, U.S. Environmental Protection Agency, Washington, D.C.

WAC 173-303, 1995, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WHC, 1988, *Environmental Investigations Instructions and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993, *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063-4, Westinghouse Hanford Company, Richland, Washington.

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