

WASTE TREATMENT AND IMMOBILIZATION PLANT
~~APPENDIX CHAPTER 4H~~
ANALYTICAL LABORATORY (LAB)
CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The “**Modification Number**” represents Ecology’s method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number
12/15/2016	8C.2016.Q3

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~~APPENDIX CHAPTER 4H~~
ANALYTICAL LABORATORY (LAB)

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APPENDIX CHAPTER 4H
ANALYTICAL LABORATORY (LAB)

TABLE OF CONTENTS

7	4H Analytical Laboratory (Lab)	5
8	4H.1 Containers	12
9	4H.1.1 Description of Containers	13
10	4H.1.2 Container Management Practices	14
11	4H.1.3 Container Labeling	15
12	4H.1.4 Containment Requirements for Storing Waste	15
13	4H.1.5 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in Containers ...	18
14	4H.2 Tank Systems.....	19
15	4H.2.1 Radioactive Liquid Waste Disposal (RLD) System	19
16	4H.2.2 Autosampling System (ASX)	19
17	4H.3 Air Emission Control.....	21
18	4H.4 Laboratory Maintenance	22
19	4H.5 Solid Waste Management	23
20	4H.5.1 Hotcell Solid Waste Management	23
21	4H.5.2 Container Storage Area for the Analytical Laboratory.....	23

TABLES

24	Table 4H-1 Analytical Laboratory Tank Systems	25
25	Table 4H-2 Analytical Laboratory Secondary Containment Rooms/Areas.....	26
26	Table 4H-3 Analytical Laboratory Sumps, Leak Detection Boxes, and Floor Drains/Lines.....	27
27	Table 4H-4 Analytical Laboratory Container Storage Areas.....	29

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1 4H Analytical Laboratory (Lab)

2 The Analytical Laboratory (Lab) is designed to incorporate the features and capability necessary to ensure
 3 efficient Hanford Tank Waste Treatment and Immobilization Plant (WTP) operations and meet
 4 permitting, process control, authorization basis, and waste form qualification requirements. The Lab is
 5 designed for “24/7” - 365 days per year operation to support peak throughput for each WTP facility. The
 6 Lab is a process support facility. The Resource Conservation and Recovery Act (RCRA) permitted
 7 portion of the Lab include the Radioactive Liquid Waste Disposal (RLD) tank system (tank and ancillary
 8 equipment) and the container storage areas. The Lab will also include satellite accumulation areas for the
 9 accumulation of secondary wastes generated by laboratory activities. Barcode readers and computer
 10 workstations are provided in designated areas to input and retrieve data from the laboratory information
 11 management system (LIMS).

12 The workstations will be logically segregated to provide a degree of isolation from possible cross
 13 contamination that could reduce the validity of the analytical results. This isolation will be a design
 14 consideration. Isolation is also provided to enhance the ability of the laboratory to function even when a
 15 room or workstation is nonfunctioning. Redundant capabilities will be provided, as appropriate, to
 16 mitigate contamination incidents to maintain required support to the processes when one system fails.

17 ~~A sample~~Samples prepared ~~in either within~~ the Analytical ~~Hotcell~~-Laboratory (AHL) or Analytical
 18 ~~Radiological Laboratory (ARL)~~ may be ~~delivered sent~~ to an off-site ~~facility-facilities for analysis~~. The
 19 sample ~~is(s) are~~ packaged according to the dose rate and destination in “strong tight containers” or
 20 shielded shipping containers. The day the shipment is scheduled to be made, the packaged sample will be
 21 surveyed for final radiological release, shipping papers including chain-of-custody forms will be verified
 22 for completion, and transferred with the shipment package.

23 The laboratory design will be validated with information from tank utilization modeling of the process
 24 tanks and operational research modeling of the treatment process, as appropriate. General arrangement
 25 drawings 24590-LAB-P1-60-00007 and -00008 in Dangerous Waste Permit (DWP) Operating Group 10,
 26 Appendix 11.4 provide a general layout of the 0’-0” and -19’-2” elevations of the Lab where analytical,
 27 maintenance, administrative, and waste management activities take place. The following attributes are
 28 outlined in the facility design figures described above:

- 29 • Workstations have been defined as required by the sampling and analysis plan for WTP process
 30 control and waste form qualification.
- 31 • Capability to provide limited process technology will be provided.
- 32 • Contamination controls have been incorporated for reliability of laboratory service to the WTP
 33 processes.
- 34 • Management of samples for off-site analysis by an outsource laboratory including feed receipt
 35 samples.

36 Drawings and other documents, found in DWP Operating Group 10, Appendix 11.0 provide additional
 37 detail for the Lab:

- 38 • General arrangement drawings showing locations of tank systems, secondary waste management,
 39 and analytical laboratory activities.
- 40 • Process flow diagrams for process information.
- 41 • Piping and instrumentation diagrams (P&IDs), mechanical drawings, typical system figures
 42 depicting the analytical laboratory tank system and ancillary equipment.

43 The Lab contains both high-activity and low-activity laboratories. High-activity samples will be managed
 44 in the analytical hotcell laboratory (AHL). Low-activity samples will be managed and analyzed in the
 45 analytical radiological laboratory (ARL), ~~also known as the Rad Labs~~. The ARL also includes a sample
 46 receiving/shipping area designed to manage the inflow of manually transported samples.

1 The AHL will operate in the Baseline configuration. Associated hotcell laboratories, tank systems, and
2 ventilation systems, will be isolated in the Direct Feed LAW (DFLAW) configuration, and will not
3 operate until Pretreatment operations begin.

4 The facility is also being designed to coordinate the management of samples that will be outsourced and
5 analyzed at off-site laboratories. Outsource laboratories will be used to analyze the majority of very
6 low-activity samples such as water quality and air emission samples. Outsource laboratories will also be
7 used to analyze double shell tank (DST) system unit characterization samples. Analytical methods and
8 equipment selected to support laboratory analyses will be in accordance with applicable requirements. A
9 LIMS network is provided to track and maintain an inventory of samples, reagents, and materials in the
10 Lab area including sample analyses and data collection. In addition, the Lab includes waste drum
11 management, maintenance, and support areas for facility operation.

12 The second floor of the Lab will be dedicated to the mechanical room, which will contain the C1 and C2
13 air handling units.

14 The RLD system vessels are located at approximately 19 ft below grade. [Table 4H-1](#) lists current tank
15 design information (capacity, materials of construction, and dimensions). Tank systems that manage
16 liquid mixed or dangerous waste are provided with secondary containments. [Table 4H-2](#) summarizes the
17 secondary containment rooms/areas and calculated minimum liner heights. Sumps, leak detection boxes,
18 and secondary containment drain systems are listed in [Table 4H-3](#).

19 Samples will be transported to the Lab in two ways. The majority of samples will be collected and
20 transported from the processing facilities via the autosampling ~~system~~ (ASX)-~~system~~. Samples will be
21 collected in a sample bottle or vial and transferred into a sample carrier. High-activity samples from the
22 Pretreatment Facility (PTF) and High-Level Waste (HLW) vitrification facility will be pneumatically
23 transferred to the hotcell sample receipt area through a dedicated transfer system for high-activity
24 samples. Low-activity samples from the Low-Activity Waste (LAW) vitrification facility will be
25 transferred directly to the sample receipt laboratory area through a dedicated low-activity transfer system.
26 ~~A~~Effluent management Facility (EMF) samples and a small percentage of samples from other facilities
27 will be transported to the laboratory manually in appropriately shielded transportation casks or containers.

28 General Description of the Analytical Radiological Laboratory (ARL)

29 The ARL is one of the two analytical areas contained within the Lab. The ARL ~~will consist~~consists of
30 thirteen laboratories commonly referred to as Rad Labs- and is designed to operate during both the
31 Baseline and DFLAW configurations. The other area is the AHL. The AHL will only operate in the
32 Baseline configuration.

33 Laboratory areas manage dangerous and/or mixed waste in Satellite Accumulation Areas (SAAs) and
34 90-Day Accumulation Areas pursuant to the generator requirements [WAC 173-303-200]. Organic
35 liquids will be segregated and managed as Lab Packs; other liquid wastes will be transferred to RLD
36 Vessels to be returned back into the WTP process.

37 The ~~Rad Labs (designation RL) are~~ARL is designed to support the preparation and analysis of low-
38 activity mixed waste samples. The ~~Rad~~-Labs also support the analyses of samples diluted, digested, and
39 prepared in the hotcell facility. Samples will be manually transferred from the hotcell facility to the ~~Rad~~
40 LabsARL. The ~~Rad Labs~~ARL will be capable of receiving these low-activity samples transferred from
41 the process facilities via the ASX ~~system~~ as well as manually transported low-activity samples from the
42 process facilities. Equipment used in the preparation of samples for analyses will be located inside the
43 fume hoods vented to the C3 ventilation system. All analyses except counting will be completed with
44 equipment located in ventilation hoods. Barcode readers and computer workstations are provided in
45 designated areas to input and retrieve data from the LIMS.

46 The ~~Rad Labs include~~ARL includes utilities and equipment required to support activities such as:

- 1 • Sample receipt and (manual) transport
- 2 • Dissolution/dilution
- 3 • Distillation/titration
- 4 • Standard/reagent preparation
- 5 • X-ray fluorescence spectrometry (XRF)
- 6 • Fourier transformation infrared spectrometry (FT-IR)
- 7 • Total Inorganic Carbon/Total Organic Carbon analyses (TIC/TOC)
- 8 • Analyses of elements and anions
- 9 • Ultraviolet and visible spectroscopy
- 10 • Preparation of samples for elemental analysis
- 11 • General physical properties analysis
- 12 • Radionuclide separation and counting
- 13 • Management of outsourced samples
- 14 • Satellite accumulation areas for secondary wastes

15 **Sample Receipt Laboratory (RL-1)**

16 The Sample Receipt Laboratory will serve as the sample receipt and staging area for the ARL. This
17 laboratory will be provided with hoods for sample receipt, inspection/evaluation, sample staging, and
18 transfers. RL-1 will also contain four shielded cabinets each ventilated to the C3V system, and
19 refrigerators for storage of samples requiring sample preservation. Sample preparations are completed
20 with equipment located in hoods vented to the C3 ventilation system. ~~Satellite Accumulation Area(s)~~
21 ~~(SAAs) will be available in the laboratory to accumulate solid wastes generated during the sample receipt,~~
22 ~~evaluation, and dispatch. Organic liquids will be segregated and managed as Lab Packs; other liquid~~
23 ~~wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP~~
24 ~~process.~~

25 **Dissolution/Dilution Lab (RL-2)**

26 The Dissolution/Dilution Lab supports general wet chemistry activities including the preparation of
27 samples for analyses that will be performed in the other Rad Labs. RL-2 will house instrumentation and
28 supplies to support a variety of sample preparation techniques. The two primary sample preparation
29 methods to be performed in RL-2 are microwave-assisted acid dissolution and fusion dissolution. Sample
30 preparations are completed with equipment located in hoods vented to the C3 ventilation system. ~~SAA(s)~~
31 ~~will be available in the laboratory to accumulate solid wastes generated during the sample preparation and~~
32 ~~analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be~~
33 ~~disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.~~

34 **Distillation/Titration Lab (RL-3)**

35 The Distillation/Titration Lab provides sample preparation including distillation, titration, and physical
36 measurements of samples. Sample preparation performed in this laboratory involves determining the
37 aliquot or sub-sample weight, measurement of the specific gravity/density of sample solutions, and acid
38 and base titrations. Sample preparations are completed with equipment located in hoods vented to the C3
39 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid wastes generated~~
40 ~~during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab~~
41 ~~Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back~~
42 ~~into the WTP process.~~

1 **Standard/Reagent Preparation Laboratory (RL-4)**

2 The Standard/Reagent Preparation Laboratory provides for prepared standards and reagents prior to their
3 distribution to the other laboratories. Sources used for infrequent calibration of counting equipment will
4 be stored in this laboratory. Sample preparations are completed with equipment located in hoods vented
5 to the C3 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid wastes
6 generated during the sample preparation and analyses. Organic liquids will be segregated and managed as
7 Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled
8 back into the WTP process.~~

9 **X-ray Laboratory (RL-5)**

10 The X-ray Laboratory is used for quantifying elemental concentrations utilizing the X-ray Fluorescence
11 (XRF) system. Optical microscopes are used for qualitatively identifying crystals as needed during
12 process troubleshooting. Analyses are completed with equipment located in hoods vented to the C3
13 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid wastes generated
14 during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab
15 Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back
16 into the WTP process.~~

17 **Instrument Laboratory (RL-6)**

18 The Instrument Laboratory supports unique functions associated with non-routine analyses. These
19 functions include sample preparation and analysis functions such as the preparation of KBr pellets,
20 preparation of dilutions and reagents for UV/VIS spectrophotometry, FT-IR Spectrometry for the
21 quantitation of compounds in liquid, gas, or solid phases, and UV/VIS spectrometry for quantitation of
22 compounds in liquids. Analyses and sample preparations are completed with equipment located in hoods
23 vented to the C3 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid
24 wastes generated during the sample preparation and analyses. Organic liquids will be segregated and
25 managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and
26 recycled back into the WTP process.~~

27 **Process Technology Laboratory (RL-7)**

28 The Process Technology Laboratory provides non-routine measurement of physical characteristics of
29 low-activity process samples and process tests. This laboratory is used for differential scanning
30 calorimeter/thermal gravimetric analysis (DSC/TGA), particle size analysis, and rheology and pH
31 measurements. Analysis and testing are completed with equipment located in hoods vented to the C3
32 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid wastes generated
33 during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab
34 Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back
35 into the WTP process.~~

36 **Process Technology Laboratory (RL-8)**

37 The Process Technology Laboratory provides testing on laboratory scale equipment to observe the
38 behavior of low-activity materials during processing through a process unit operation and to define
39 anomalies to routine processing. All analyses are completed with equipment located in hoods vented to
40 the C3 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid wastes
41 generated during the sample preparation and analyses. Organic liquids will be segregated and managed as
42 Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled
43 back into the WTP process.~~

44 **Elemental Analysis Laboratories (RL-9 and RL-9A)**

45 The Elemental Analysis Laboratories are used for the preparation and analysis of medium level
46 radioactive samples using an inductively coupled plasma/atomic emission spectrometer (ICP/AES)

1 instrument for the analysis of elements, inductively coupled plasma/mass spectrometer (ICP/MS)
2 instrument for the analysis of elements and specific radionuclides, and mercury analyzer for the analysis
3 of mercury. The Elemental Analysis Laboratory RL-9A is a duplicate of Elemental Analysis Laboratory
4 RL-9; RL-9A is a backup to RL-9. The space is available for the setup of process development
5 evaluations. ~~SAA(s) will be available in the laboratories to accumulate solid wastes generated during the~~
6 ~~sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other~~
7 ~~liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP~~
8 ~~process. All analyses are completed with equipment located in hoods vented to the C3 ventilation system.~~

9 **General Chemistry Lab (RL-10)**

10 The General Chemistry Lab is used to prepare and analyze samples using the Ion Chromatography (IC)
11 for analysis of selected anions and organic acids, and the Total Carbon analyzer ~~(TC)~~ for total inorganic
12 carbon, and total organic carbon (TIC/TOC) analysis. RL-10 equipment is split such that instrument
13 electronics are on benches adjacent to fume hoods and the components for sample contact are inside
14 hoods vented to the C3 ventilation system. ~~SAA(s) will be available in the laboratory to accumulate solid~~
15 ~~wastes generated during the sample preparation and analyses. Organic liquids will be segregated and~~
16 ~~managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and~~
17 ~~recycled back into the WTP process.~~

18 **Rad Preparation Laboratories (RL-11 and RL-12)**

19 The Rad Preparation Laboratories are used for sample preparation and separation of various radionuclides
20 for analysis by nuclear spectroscopy (counting). Both of the laboratories will be identical in size and will
21 have the capability to provide limited redundancy or both labs can be used to provide additional capacity.
22 ~~SAA(s) will be available in the laboratories to accumulate solid wastes generated during the sample~~
23 ~~preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid~~
24 ~~wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP~~
25 ~~process. All analyses are completed with equipment located in hoods vented to the C3 ventilation system.~~

26 **Rad Counting Laboratory (RL-13)**

27 The Rad Counting Laboratory is used for analyzing prepared samples, standards, and control sources.
28 This laboratory will accommodate instrumentation for measurements of alpha, beta, and gamma radiation
29 in samples transferred from the Rad Preparation Laboratories RL-11 and RL-12. There will be no hoods,
30 water distribution, or sinks in this room. Samples will be manually transported on a cart from the Rad
31 Preparation Laboratories. Shielded storage areas will be provided for temporary staging of samples,
32 calibration and control check sources. Analyses will be completed using gamma spectrometer systems,
33 gas-flow proportional counters for gross alpha/beta analysis, alpha spectroscopy multi-detector systems,
34 and liquid scintillation counting systems for beta analysis. ~~SAA(s) will be available in the room to~~
35 ~~accumulate solid waste generated during the receiving and packaging operations.~~

36 **Sample Shipping and Receiving Area (Rm A-0141F)**

37 The Sample Shipping and Receiving Area is located adjacent to the primary airlock and is used for
38 receiving manually delivered samples. This room will provide space for loading casks for off-site
39 transport of samples as required. This room will also provide an area with low contamination potential
40 and reduces the need for decontamination of casks and containers for off-site radiological release. This
41 area provides equipment to receive and transfer samples, chain of custody, staging for shipment to off-site
42 facilities, and transfer to RL-1 or into the Sample Receipt Hotcell (HC-1) if the radioactivity level is
43 determined to require shielding. A fume hood is provided to support sample receipt, packaging, and
44 preparation for shipment.

45 If the sample is to be shipped to another facility, the sample will be placed on shelving or in the
46 refrigerator awaiting shipping. If a sample originating in the Lab is to be shipped to another laboratory,

1 the exterior of the sample container will be decontaminated and brought to this location for staging for
 2 shipment. ~~SAA(s) will be available in the room to accumulate solid waste generated during the receiving
 3 and packaging operations. Organic liquids will be segregated and managed as Lab Packs; other liquid
 4 wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP
 5 process.~~

6 General Description of the Analytical Hotcell Laboratory (AHL)

7 ~~Process~~In the Baseline configuration process samples from the WTP PTF and HLW facility taken by the
 8 ASX ~~system~~ are delivered to the Hotcell Receipt Station (HCRS) by a pneumatic transfer system.
 9 Samples from outside the WTP that require shielding are delivered to the hotcell in shielded sample
 10 carriers called pigs. Barcode readers are provided in each hotcell and a computer workstation is provided
 11 to input and retrieve data from the LIMS. A trolley is provided for inter-cell transfers of samples and
 12 smaller equipment items. A monorail is provided to move large equipment. Each hotcell is provided
 13 with an appropriate number of master slave manipulators (MSMs) to accomplish in-cell tasks remotely.
 14 The equipment used to perform the functions described in the following sections is representative of
 15 typical activities for safely performing operations on highly radioactive samples.

16 The AHL consists of 14 hotcells (HC), one hood assembly, and three glovebox assemblies adjoining the
 17 hotcell structure. The facility includes equipment in Hotcells 1 through 14 with the Hotcell 14
 18 functioning as the secondary waste management area, and a more detailed description of Hotcell 14 waste
 19 management activities is provided in Appendix Section 4H.54, Solid Waste Management. Gloveboxes
 20 adjoining HC-12 and HC-13 will house the ICP/AES and ICP/MS instruments.

21 Samples will be moved into and between the hotcells using the trolley or monorail. Ventilation flow from
 22 the hotcell area, including the waste cell, will be routed to the C5 HEPA filtration system.

23 **Sample Receipt (HC-1)**

24 The Sample Receipt Hotcell is located at the north end of the series of analytical hotcells. One glovebox
 25 assembly on HC-1 will be used to transfer samples and material out of the hotcells. One hood assembly
 26 on HC-1 will be used to introduce manually drawn samples into HC-1. This hotcell is outfitted with four
 27 MSM arms (two pairs) on the east and west sides to provide full floor coverage. The HCRS on top of
 28 HC-1 provides for the delivery of samples from the ASX ~~system~~. The mechanical de-capping of sample
 29 bottles, transferring samples to transparent container, and capping with a screw-type lid is performed in
 30 HC-1. HC-1 also provides radiation dose rate probe and meter to estimate the radiation level of both
 31 incoming and outgoing samples, pH meter for measurement of samples, and a barcode reader (or similar
 32 device) to identify and track sample containers.

33 The ASX HCRS is located on top of HC-1. The sample carrier will be delivered from an HLW or PTF
 34 ASX sampler to the HCRS. The HCRS will remove the sample bottle from the carrier utilizing robotics
 35 and place it in a chute attached to HC-1. ~~SAA(s) will be available in the hotcell to accumulate solid
 36 wastes generated during the sample preparation and analyses. Organic liquids will be segregated and
 37 managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and
 38 recycled back into the WTP process.~~

39 **Sample Preparation (HC-2 and HC-3)**

40 The Sample Preparation Hotcells are located south of the sample receiving hotcell and each hotcell will
 41 be outfitted with two MSMs. Activities carried out in these hotcells include the generation of individual
 42 sample aliquots using sample homogenizer, electronic scales, centrifuge, filtration, stirring, and
 43 desiccators. Individual sample aliquots are then transferred to other hotcells for further analysis. ~~SAA(s)
 44 will be available in the hotcell to accumulate solid wastes generated during the sample preparation and
 45 analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be
 46 disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.~~

1 **Limited Process Technology (HC-4)**

2 The limited process technology hotcell provides space for the evaluation of anomalies occurring in the
3 processing facilities such as potential plugging of ultrafilters, ion exchange malfunction and material
4 foaming, etc. This hotcell may also be used to prepare coupons for analyses in hotcells 12 and 13. This
5 cell has one pair of MSMs and necessary sample preparation equipment (furnaces, drying ovens,
6 balances, etc.) to complete process testing. ~~SAA(s) will be available in the hotcell to accumulate solid
7 wastes generated during the sample preparation and analyses. Organic liquids will be segregated and
8 managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and
9 recycled back into the WTP process.~~

10 **Physical Properties (HC-5)**

11 The physical properties hotcell provides space for measurements such as rheology, solids, and particle
12 size measurements to support process operations. This hotcell is provided with a pair of MSMs, and
13 necessary sample preparation equipment (furnaces, drying ovens, balances, etc.) to complete process
14 testing. ~~SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample
15 preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid
16 wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.~~

17 **Dissolution and Dilution Hotcells (HC-6 and HC-7)**

18 The dissolution and dilution hotcells will be used to perform thermal-assisted acid digestion and alkali
19 fusion dissolutions of WTP process samples. Each hotcell contains a pair of MSMs and work surface for
20 dissolving slurry feed samples (such as from the melter feed preparation vessels) and glass shards. The
21 equipment used to prepare samples in the dissolution/dilution hotcells includes microwave and/or
22 convection ovens and accessories for heating and testing sample mixtures such as furnaces, drying ovens,
23 balances, pH meters. ~~SAA(s) will be available in the hotcell to accumulate solid wastes generated during
24 the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other
25 liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP
26 process.~~

27 **Radionuclide Preparation Hotcells (HC-8 and HC-9)**

28 The radionuclide preparation hotcells will be used to separate radionuclides for further isolation and also
29 to reduce the radiological dose rate of samples for export from the hotcells for counting and analyses in
30 ARL. The equipment required to prepare samples consists of small pre-packed ion exchange columns
31 and other support equipment such as balances and glassware. ~~SAA(s) will be available in the hotcells to
32 accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be
33 segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain
34 (RLD system) and recycled back into the WTP process.~~

35 **Ion Chromatography (IC) and Total Inorganic Carbon/Total Organic Carbon Preparation (HC-10)**

36 The Ion Chromatography and Total Inorganic and Organic Carbon Preparation hotcell is used to prepare
37 samples for IC or TIC/TOC analyses in the ARL. Liquid samples for anion and TIC/TOC analyses are
38 diluted and transferred to the Rad Lab. Solids are digested, diluted, and transferred to the Rad Lab for
39 analyses. This preparation is needed to reduce dose rates to an acceptable level for analysis in Rad Labs.
40 The equipment required to prepare samples consists of containers for performing water digestions,
41 volumetric flasks and pipettes for diluting the samples and addition of control reagents, and filtration
42 apparatus and vacuums for assisting in sample filtration. ~~SAA(s) will be available in the hotcell to
43 accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be
44 segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain
45 (RLD system) and recycled back into the WTP process.~~

1 **Boildown and Physical Properties (HC-11)**

2 This hotcell will provide the capability to determine the volume reduction of sample material achievable
3 before solids form, to test the compatibility of different waste types and to develop analytical methods.
4 The hotcell will be outfitted with the general equipment capabilities. Equipment required to prepare
5 and/or test samples will include stirrers to homogenize sample materials, vessels to composite samples,
6 and filtration systems to separate solids from liquids. ~~SAA(s) will be available in the hotcell to
7 accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be
8 segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain
9 (RLD system) and recycled back into the WTP process.~~

10 **ICP Preparation and Analyses (HC-12 and HC-13)**

11 The ICP Preparation and Analysis hotcell receives samples prepared in hotcells 2, 3, 4, 6 & 7. These
12 hotcells will receive samples previously diluted in the sample preparation hotcells (HC-2 and HC-3) or
13 made into coupons in Limited Process Technology hotcell (HC-4) or from the dissolution/dilution
14 hotcells (HC-6 and HC-7). A glovebox approximately 4 feet (ft) by 4 ft will be attached perpendicular to
15 the exterior of each hotcell. An ICP/AES and an ICP/MS will be integrated with the gloveboxes at
16 hotcells 13 and 14. Equipment necessary to prepare and/or analyze samples in HC-12 and HC-13 will
17 include:

- 18 • Volumetric glassware to perform sample dilutions.
- 19 • Pipettes to add spikes and reagents to samples.
- 20 • Stirrers to homogenize solutions.
- 21 • Analytical balance to perform dilutions by weight.
- 22 • Attached glovebox exterior to the hotcell.
- 23 • ICP/AES instrument integrated with the glovebox.
- 24 • ICP/MS instrument integrated with the glovebox.
- 25 • Laser system to ablate particulates from the surface of a prepared glass coupon.
- 26 • Sample positioning and focusing system to properly ablate glass particulates.
- 27 • Optical viewing system to observe and align area of the glass coupon for ablation.

28 **Hotcell Solid Waste Management (HC-14)**

29 Mixed and dangerous solid waste will be accumulated ~~in~~within the hotcells in SAAs and periodically
30 placed in waste drums. Solid waste management in the hotcell will require remote handling. Waste from
31 the SAAs which is ready to be removed from the hotcells is transferred to HC-14 where it can be removed
32 from the hotcells into awaiting waste drum(s). Details about secondary waste management in the Hotcell
33 Solid Waste Management area is provided in Section 4H.4.1-Section 4H.5.1. Liquid waste along with
34 unused sample portions can be disposed of directly to the RLD system via hotcell drains.

35 **4H.1 Containers**

36 This section identifies the containers and container management practices that will be followed at the Lab.
37 The term “container” is used as defined in Washington Administrative Code ([WAC](#)) [173-303-040](#). Note
38 that in this ~~appendix chapter~~ and throughout the permit, terms other than containers may be used, such as
39 canisters, boxes, bins, flasks, casks, and overpacks.

40 The container storage area (secondary waste) located within the Lab consists of the following rooms:

- 1 • Waste Drum Management Room (A-0139)
- 2 • Lab Pack Room (A-0139A)
- 3 • Airlock (A-0139B)
- 4 • Volume Reduction Room (A-0139C)
- 5 • Airlock/Clean Drum Export Room (A-0139D)

6 Container storage area dimensions at the Lab are summarized in [Table 4H-4](#).

7 The following sections address waste management containers:

- 8 • Description of Containers - Section 4H.1.1
- 9 • Container Management Practices - Section 4H.1.2
- 10 • Container Labeling - Section 4H.1.3
- 11 • Containment Requirements for Storing Waste - Section 4H.1.4
- 12 • Prevention of Ignitable, Reactive, and Incompatible Wastes in Containers - Section 4H.1.5

13 **4H.1.1 Description of Containers**

14 These types of waste will be managed in containers:

- 15 • Miscellaneous mixed waste (secondary waste)
- 16 • Miscellaneous nonradioactive dangerous waste (secondary waste)

17 The waste form dictates the type of containers used for waste management. The following paragraphs
18 describe these types of containerized waste that are managed at the Lab.

19 Miscellaneous Mixed Waste

20 Generally, miscellaneous mixed wastes are secondary wastes that may include, but are not limited to, the
21 following items:

- 22 • Spent or failed equipment
- 23 • ~~Offgas~~HVAC HEPA filters
- 24 • Analytical laboratory waste

25 Spent equipment and offgas filters will typically be managed in commercially-available containers such
26 as steel drums or steel boxes, of varying size. The containers for miscellaneous mixed waste will comply
27 with transportation requirements, with receiving treatment, storage, and disposal (TSD) facility waste
28 acceptance criteria, and will be compatible with the miscellaneous mixed waste. These containers may or
29 may not include a liner. Final container selection, container and waste compatibility, and the need for
30 liners, will be based on the physical, chemical, and radiological properties of the waste being managed.

31 Each miscellaneous mixed waste container will have associated documentation that describes the
32 contents, such as waste type, physical and chemical characterization, and radiological characterization.
33 This information will be retained within the plant information network.

34 Most miscellaneous secondary mixed wastes will be spent equipment and consumables such as pumps, air
35 lances, HEPA filters, etc., and are not expected to contain liquids. If wastes are generated that contain
36 small quantities of liquids, ~~these wastes may absorbent products will be treated-added to remove-or~~ absorb
37 liquids, to comply with the receiving TSD facility waste acceptance criteria. In addition, the analytical
38 laboratory will generate containerized liquid waste (Lab Packs).

1 Miscellaneous Nonradioactive Dangerous Waste

2 Each nonradioactive dangerous waste container will have associated documentation that describes the
3 contents, such as waste type and physical and chemical characterization. Typically, commercially
4 available containers will be used. The types of containers used for packaging nonradioactive dangerous
5 waste will comply with the receiving TSD facility waste acceptance criteria and transportation
6 requirements. However, final container selection, container and waste compatibility, and the need for
7 liners will be based on the physical and chemical properties of the waste being managed.

8 **4H.1.2 Container Management Practices**

9 The following paragraphs describe how each of the containers used at the Lab are managed.

10 **4H.1.2.1 Miscellaneous Mixed Waste and Miscellaneous Nonradioactive Dangerous**
11 **Waste Containers**

12 Miscellaneous Mixed Waste Containers

13 Miscellaneous mixed waste (secondary waste) will be managed in:

- 14
 - Laboratory waste management area (A-0139 and A-0139A/B/C/D)

15 Containers will be kept closed unless waste is being added, removed, or sampled while in the containment
16 storage areas. Containers stored in these areas will be placed on pallets, or otherwise elevated to prevent
17 contact with liquid, if present. [Table 4H-4](#) summarizes the dimensions and maximum capacity of
18 miscellaneous mixed waste storage areas. Containers will be managed in designated areas throughout the
19 Lab, and then transferred to a suitable TSD facility.

20 The laboratory waste management area (A-0139 and A-0139A/B/C/D) will be located in the southern
21 portion on the 0 ft elevation of the Lab. The unit will be used for storage of miscellaneous waste
22 containers prior to disposition to a receiving TSD facility. The aisle space will be 30 inches (in.) and
23 waste containers may or may not be stacked. This unit's storage capacity is listed in [Table 4H-4](#).

24 Miscellaneous Nonradioactive Dangerous Waste Containers

25 Miscellaneous dangerous waste containers will typically be managed in ~~permitted or~~ non-permitted waste
26 management units (SAAs and less-than-90-day storage areas) located throughout the Lab. Containers
27 will be kept closed unless waste is being added, removed, or sampled. They will routinely be moved by
28 forklift or drum cart, and will be managed in a manner that prevents ruptures and leaks.

29 **4H.1.2.2 Waste Tracking**

30 The plant information network interfaces with the integrated control network and is designed to collect
31 and maintain plant information. The plant information network is currently planned to include the
32 following systems (all systems used at the plants/facilities and balance of facilities are provided for
33 information only):

- 34
 - Plant data warehouse and reporting system
 - 35 • Laboratory information management system
 - 36 • Waste tracking and inventory system

37 Inventory and Batch Tracking

38 The waste tracking and inventory system will interface with the information system data historian to
39 provide reporting information such as tank volumes, waste characteristics, and facility inventories of
40 process waste. The waste tracking system will also be used to query operations parameters at any time
41 information is needed, as specified by operations, to manage the process system.

1 Secondary Waste Stream Tracking

2 Containerized secondary waste streams and equipment will be tracked and managed through
3 commercially available database management software. Containers will be mapped in each plant and
4 updated during the inspection process using a commercially available drawing software application.

5 Laboratory Information Management System

6 The laboratory information management system (LIMS) will be an integral feature of the plant
7 information network. The LIMS will serve as an essential tool for providing data management of
8 regulatory and processing samples. The chosen LIMS will be a commercial off-the-shelf software
9 package designed for performing laboratory information management tasks as described in ASTM
10 E1578-93, *Standard Guide for Laboratory Information Management Systems (LIMS)*.

11 The LIMS will track the flow of samples through the laboratory. Samples received in the laboratory will
12 be identified with a unique identification label. The identification label provides details of the sample
13 process stream. Baseline analyses are defined by the requesting plant. Additional analyses, as required,
14 will be input into LIMS by laboratory analysts. Data will be input into LIMS manually or by data transfer
15 using LIMS/instrument interface. Analyses will be performed using approved and validated analytical
16 procedures.

17 Analytical results will be compiled by the LIMS and held pending checking and approval by appropriate
18 staff. Approved results will be reported to the requesting plant.

19 **4H.1.3 Container Labeling**

20 Miscellaneous Mixed Waste Containers

21 The miscellaneous mixed waste containers will be labeled with the accumulation or generation start date,
22 as appropriate, the major risk(s) associated with the waste, and the words “hazardous waste” or
23 “dangerous waste.” A waste tracking and inventory system will be implemented. Labels and markings
24 will be positioned so that required information is visible. The label will meet the [WAC 173-303-630\(3\)](#)
25 requirements, and the dangerous waste number will be clearly identified.

26 Miscellaneous Dangerous Waste Containers

27 The miscellaneous dangerous waste drums will be labeled with the accumulation or generation start date,
28 as appropriate, the major risk(s) associated with the waste, and the words “hazardous waste” or
29 “dangerous waste”. A waste tracking and inventory system will be implemented. Labels and markings
30 will be positioned so that required information is visible. The label will meet the [WAC 173-303-630\(3\)](#)
31 requirements, and the dangerous waste number will be clearly identified.

32 **4H.1.4 Containment Requirements for Storing Waste**

33 Secondary containment requirements for the waste are discussed below.

34 **4H.1.4.1 Secondary Containment System Design**

35 Secondary containment is required for areas in which containers hold free liquids. It is also required for
36 areas managing wastes exhibiting the characteristics of ignitability or reactivity as defined in
37 [WAC 173-303-090\(5\)](#) and (7).

38 Miscellaneous Mixed Waste

39 ~~Miscellaneous mixed waste storage areas may contain waste requiring secondary containment. If wastes~~
40 ~~containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated,~~
41 ~~portable secondary containment that meets the requirements of [WAC 173-303-630\(7\)](#) will be~~
42 ~~provided. Containers can be placed on portable secondary containment systems or elevated (e.g., pallets,~~
43 ~~skids), to protect the containers from contacting accumulated liquids. Waste that does not contain free~~

1 liquids or is not ignitable or reactive does not require a containment device as stated in WAC 173-303-
2 630(7)(c) since the areas are within a building and are protected from precipitation. Further
3 documentation discussing how WTP meets the WAC and permit requirements for storage areas in the Lab
4 are located in the operating record.

5 Miscellaneous Dangerous Waste

6 ~~Miscellaneous dangerous waste storage areas may contain waste requiring secondary containment. If~~
7 ~~wastes containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated,~~
8 ~~portable secondary containment that meets the requirements of WAC 173-303-630(7) will be~~
9 ~~provided. Containers can be placed on portable secondary containment systems or elevated (e.g., pallets,~~
10 ~~skids), to protect the containers from contacting accumulated liquids. Waste that does not contain free~~
11 ~~liquids or is not ignitable or reactive does not require a containment device as stated in WAC 173-303-~~
12 ~~630(7)(c) since the areas are within a building and are protected from precipitation. Further~~
13 ~~documentation discussing how WTP meets the WAC and permit requirements for storage areas in the Lab~~
14 ~~are located in the operating record.~~

15 4H.1.4.2 System Design

16 The exterior walls of the waste management area (WMA) are constructed of reinforced concrete and the
17 entire floor area is coated with a special protective coating. Coatings are provided to support the clean-up
18 and decontamination of a potential spill and are not designed to provide secondary containment. The
19 secondary containment requirement for containers containing liquid waste is met by using portable
20 secondary containment pallets. The container storage areas in Rooms A-0139 and A-0139A, A-0139B,
21 A-0139C, and A-0139D are not designed with containment systems as stated in WAC 173-303-630(7)(c)
22 since the areas are within a building and protected from precipitation. Containers can be placed on
23 portable secondary containment systems or elevated (e.g., pallets, skids), to protect the containers from
24 contacting accumulated liquids. Waste that does not contain free liquids or is not ignitable or reactive
25 does not require a containment device as stated in WAC 173-303-630(7)(c) since the areas are within a
26 building and are protected from precipitation.

27 Miscellaneous Mixed Waste

28 There will be a miscellaneous mixed waste (secondary waste) container storage area at the Lab, as
29 follows:

- 30 • Laboratory waste management area (A-0139 and A-0139A/B/C/D)
- 31 • Miscellaneous mixed waste containers can be placed on portable secondary containment systems
32 or elevated (e.g., pallets, skids), to protect the containers from contacting accumulated liquids.
33 Waste that does not contain free liquids or is not ignitable or reactive does not require a
34 containment device as stated in WAC 173- 303-630(7)(c) since the areas are within a building
35 and are protected from precipitation. Further documentation discussing how WTP meets the
36 WAC and permit requirements for storage areas in the Lab are located in the operating record.

37 Miscellaneous Dangerous Waste~~Containers with liquids will be provided with portable~~
38 ~~secondary containment meeting the requirements of WAC 173-303-630(7).~~

- 39 • Miscellaneous dangerous waste containers can be placed on portable secondary containment
40 systems or elevated (e.g., pallets, skids), to protect the containers from contacting accumulated
41 liquids. Waste that does not contain free liquids or is not ignitable or reactive does not require a
42 containment device as stated in WAC 173- 303-630(7)(c) since the areas are within a building
43 and are protected from precipitation. Further documentation discussing how WTP meets the
44 WAC and permit requirements for storage areas in the Lab are located in the operating record.

1 ~~4H.1.4.2~~4H.1.4.3 **Structural Integrity of the Base**

2 The ~~storage areas will be constructed~~WMA floor is not designed nor intended to support storage and
3 ~~transportation, provide secondary containment of materials. Therefore, no structural integrity assessment~~
4 ~~is required. Secondary containment is provided by commercially available portable secondary~~
5 ~~containment pallets/devices designed to contain 10% of the volume of all containers within the~~
6 ~~containment pallet, or the volume of the largest container storage areas and will be designed with the~~
7 ~~following, whichever is greater.~~

8 ~~4H.1.4.3 Containment system capable of collecting and holding spills and leaks.~~

9 ~~4H.1.4.4 Base will be free of cracks and gaps and sufficiently impervious to contain~~
10 ~~leaks.~~

11 ~~4H.1.4.5 Positive drainage control.~~

12 ~~4H.1.4.6 Sufficient containment volume.~~

13 ~~4H.1.4.7 Sloped to drain or remove liquid, as necessary.~~

14 ~~4H.1.4.8~~4H.1.4.4 **Containment System Capacity**

15 Miscellaneous Mixed Waste

16 Liquid waste may be stored in the laboratory waste management area. Each container holding liquid
17 dangerous waste will be placed into portable secondary containment that meets the requirements of
18 [WAC 173-303-630\(7\)](#). The waste container will function as the primary containment while the portable
19 containment device will function as the secondary containment.

20 Each portable secondary containment will have the capacity to contain 10% of the volume of all
21 containers within the containment area, or the volume of the largest container, whichever is greater.

22 Miscellaneous Dangerous Waste

23 Each container holding liquid nonradioactive dangerous waste will be placed into portable secondary
24 containment. The waste container will function as the primary containment while the portable
25 ~~sump~~secondary containment will function as the secondary containment.

26 Each portable secondary containment will have the capacity to contain 10% of the volume of all
27 containers within the containment area, or the volume of the largest container, whichever is greater.
28 Typically, the waste containers will be steel drums.

29 ~~4H.1.4.9~~4H.1.4.5 **Control of Run-On**

30 Miscellaneous Mixed Waste

31 Run-on will not reach the interior of the miscellaneous mixed waste storage areas, because they will be
32 located within ~~buildings, which will have roof~~the Lab building which is provided with a grated
33 precipitation collection trough located outside of the container storage area roll-up doors. Additionally,
34 the building is provided with gutters to remove precipitation.

35 Miscellaneous Dangerous Waste

36 Run-on will not reach the interior of the miscellaneous dangerous waste storage areas, because the Lab
37 building is provided with a grated precipitation collection trough located outside of the container storage
38 area roll-up doors. Miscellaneous dangerous waste will be managed in buildings with walls and roof to
39 remove precipitation.

4H.1.4.104H.1.4.6 Removal of Liquids from Containment System

Miscellaneous Mixed Waste

Portable secondary containment ~~sumps~~ will be provided for individual containers that contain liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary containments.

Miscellaneous Dangerous Waste

Portable secondary containment ~~sumps~~ will be provided for individual containers that contain liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary containments.

4H.1.4.114H.1.4.7 Demonstration that Containment is not Required because Containers do not Contain Free Liquids, Wastes that Exhibit Ignitability or Reactivity, or Wastes Designated F020-023, F026 or F027

Miscellaneous Mixed Waste

Liquids may be present in wastes in the laboratory waste management area. Secondary containment will be provided for individual containers that manage liquids. ~~The laboratory waste management area may manage D001 and D003 waste.~~ Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system. Therefore, these waste numbers will not be present at the Lab.

Miscellaneous Dangerous Waste

~~Secondary containment will be provided for individual containers that manage liquids.~~ Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system. Therefore, these waste numbers will not be present at the Lab.

4H.1.5 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in Containers

Ignitable, Reactive, or Incompatible Miscellaneous Mixed Waste and Miscellaneous Dangerous Waste

~~Potentially incompatible wastes are not expected to be managed in the miscellaneous mixed waste storage areas, except for the laboratory waste management area. If such wastes are managed in this area, the~~The Lab generates and stores containers of ~~incompatible~~dangerous or mixed waste exhibiting the characteristics of reactivity (D003) and ignitability (D001) as defined in WAC 173-303-090(5) and (7). Incompatible waste includes waste ~~or chemicals will not be stored in close proximity to each other that is unsuitable for mixing with another waste or material because the mixture might produce heat or pressure, fire or explosion, violent reaction, toxic fumes, mists, or gases, or flammable fumes or gases. Proper precautions are taken to prevent any off-normal situations from occurring.~~ Acids and bases ~~will be~~are stored ~~in flammable storage cabinets or~~ on separate portable secondary ~~e~~ontainment sumps~~containments~~; oxidizers ~~will be~~are stored ~~in areas separate~~separately from combustible materials; and corrosive ~~ehemicals will be~~waste are stored on ~~a~~ separate portable secondary ~~e~~ontainment sump~~containments or in flammable cabinets~~. These separate storage areas within the ~~unit will be~~WMA are clearly marked with signs indicating the appropriate waste ~~to be stored in each area.~~category. Incompatible waste containers are stored at least thirty inches apart.

~~Separate labpack containers are used, and other waste types are not packed with ignitable waste. Ignitable, reactive, or incompatible waste is separated from containers of other waste types in the WMA. Within the WMA, ignitable or reactive waste are placed on separate portable secondary containment systems, such as individual spill pallets. Personnel inspect the containers for proper packaging, marking, and waste information before transport.~~ Potentially incompatible waste will be stored at least one aisle width (30") apart.

1 **4H.2 Tank Systems**

2 **4H.2.1 Radioactive Liquid Waste Disposal (RLD) System**

3 The analytical laboratory RLD system is primarily composed of the following:

- 4 • Floor Drain Collection Vessel (RLD-VSL-00163)
- 5 • Laboratory Area Sink Collection Vessel (RLD-VSL-00164)
- 6 • Hotcell Drain Collection Vessel (RLD-VSL-00165)
- 7 • Associated ancillary equipment

8 The Floor Drain Collection Vessel (RLD-VSL-00163) collects, contains, and transfers noncontaminated
9 liquid effluent. The floor drain collection vessel is identified as part of the RLD system. It is not
10 designed or permitted to manage mixed or dangerous wastes. If a spill or release were to occur that
11 contaminated this vessel, the vessel will be discharged to the Laboratory Area Sink Collection Vessel
12 (RLD-VSL-00164) or the Hotcell Drain Collection Vessel (RLD-VSL-00165) and rinsed with water prior
13 to being returned to service. This vessel collects effluent from radiological laboratory floor drains,
14 eyewash, and safety shower equipment. The vessel also collects effluent from the C2 area floor drains
15 located in areas such as the laboratory area corridors, hotcell bay area, and the filter room.

16 ~~Liquid waste management~~The laboratory area sink drain collection vessel (RLD-VSL-00164) is located in
17 the ~~hotcell will require remote handling prior to disposal to the Hotcell Drain Collection~~C3 Effluent
18 Vessel (~~RLD-VSL-00165~~) from low point drains. Cell under the C3 filter/fan room in the Lab. Aqueous
19 liquid ARL waste consists of samples (unused and residues), dilutions, and dissolution aliquots prepared
20 for analysis. Liquids will be partially neutralized to reduce corrosivity ~~before they are discharged to the~~
21 ~~liquid waste system.~~ Containers of aqueous liquids will be poured down ARL fume hood sink drains and
22 flushed with a minimum of 0.5 gallon of flush water for each 40 milliliters (mL) of sample before they are
23 discharged to the RLD-VSL-00164. While operating in the DFLAW configuration, the contents
24 laboratory area sink drain collection vessel will be transferred to the EMF DEP system for evaporation
25 and treatment prior to being returned to the LAW vitrification process, or treated at the Liquid Effluent
26 Retention Facility/Effluent Treatment Facility (LERF/ETF). During cold commissioning, the vessel may
27 discharge to a tanker truck.

28 After the PT Facility is brought on-line, while operating in the baseline configuration, the contents of the
29 laboratory area sink drain collection vessel will be transferred to the hotcell drain collection vessel
30 (RLD-VSL-00165). The contents of RLD-VSL-00165 are then transferred to the PTF for treatment in the
31 PTF and HLW vitrification process or treated at the LERF/ETF.

32 In the Baseline configuration liquid waste management in the hotcell will require remote handling prior to
33 disposal to the Hotcell Drain Collection Vessel (RLD-VSL-00165) from hotcell cup sink drains.
34 Aqueous liquid AHL waste consists of samples (unused and residues), dilutions, and dissolution aliquots
35 prepared for analysis. Liquids will be partially neutralized to reduce corrosivity before they are
36 discharged to the liquid waste system. Containers of aqueous liquids for disposal are moved to and
37 poured down ~~low point drain~~hotcell cupsink drains using the MSMs along with a minimum of 0.5 gallon
38 of flush water for each 20 milliliters (mL) of wastesample. Liquid waste information (including quantity
39 of liquid waste per disposal and identification of the sample that generated the waste) for each of the Lab
40 RLD vessels is updated in LIMS using the computer workstation.

41 **4H.2.2 Autosampling System (ASX)-System**

42 The ASX is considered one of the laboratory systems; however, it includes components in the other WTP
43 facilities. The ASX ~~system~~ includes the autosampling assemblies in each of the WTP chemical process
44 facilities and the Pneumatic Transfer System (PTS) that transports samples between those facilities and
45 the Lab and will only be operational in the Baseline configuration. Samples from the EMF will be

1 manually transferred to the Lab. The ASX is a support system that collects and manages samples from
2 each of the process facilities. The DWP regulates the secondary containment of sample feed and sample
3 return process piping and sample line flush piping internal to the PTF, HLW, and LAW sampler as
4 described in Section 4H.2.2.1, Autosampler Secondary Containment and Leak Detection Functions.

5 Four ASX samplers are located in the PTF, three are located in the HLW facility, and two are located in
6 the LAW facility. Each sampler interfaces with the process systems that require sampling of their
7 contents via a process sample pipe loop. The loop will deliver process waste for sample collection to the
8 sampler and return the pumped fluid, minus the collected sample, to the vessel from which it originated.

9 The PTS is a network of transport tubes, diverters, exhausters, HEPA filters, and controlled arrival
10 stations that work concurrently to transfer the carriers and sample bottles to and from the analytical
11 laboratory. Low-activity samples are delivered to the Fumehood Receipt Station in the analytical
12 laboratory. The HCRS is the analytical laboratory receipt station for HLW and PTF samples. The
13 Autosampling Control System (ASJ) will control and monitor the ASX process.

14 For high-frequency sampling and for highly radioactive, medium activity and transuranic-bearing
15 streams, the sampling process is automated. Manual sampling techniques are primarily reserved for
16 low-activity, low frequency, and large volume sample applications, or where needle-sampling techniques
17 are inappropriate.

18 The WTP sampling systems for high-activity (HA) and low-activity (LA) sampling are independent and
19 segregated because of the requirements for handling the HA samples when they reach the Lab. Both the
20 HA and LA sample lines will transfer only one sample carrier at a time. The HA sampling system
21 collects and pneumatically transfers samples from the PTF and HLW facilities to the Sample Receipt Lab
22 Hotcell (HC-1). The LA sample line transfers samples collected from the LAW facility directly to the
23 radiological laboratory. Diverters will provide junction points that enable the sample carriers to be routed
24 to and from destinations on the transfer line. Tracking switches along the transfer lines will be used to
25 track sample carrier movement. In addition to the primary HA and LA sample lines, samples from the
26 tank farms or other locations, and grab samples taken from WTP facilities, will be manually delivered to
27 the Lab in shielded sample carriers.

28 Process liquids will be circulated through pipe lines into and out of the autosampler enclosures. Samples
29 are collected by the ISOLOK samplers located in these recirculation loops. A supply line isolation valve
30 will secure the recirculation process upon completion of sampling.

31 The mechanical process for ASX sample collection will commence by dispatching a carrier and sample
32 bottle from the storage/dispatch magazine in the Lab and receiving it at the sampler docking station. The
33 robotic arm will interface with the carrier at the glovebox docking port to retrieve the empty sample bottle
34 from the carrier. The robotic arm will drive the sample bottle on to the ISOLOK sample injection needle.
35 The ISOLOK captures, retains, and injects a specific volume of process material into the sample bottle.
36 The ISOLOK sampler uses a pneumatically driven plunger to “grab” a measured sample volume of
37 flowing material with each extension and retraction. The quantity collected for a sample, then, will be
38 determined by the number of strokes set for the sample drawn.

39 The robotic arm replaces the filled sample bottle into the carrier, at the glovebox docking port, and the
40 carrier is then flown through the PTS flight tube back to the HA or LA Lab receipt station where the
41 sample will be retrieved for analysis. The carrier will also contain any potential leakage in the event of
42 sample bottle damage or malfunction.

43 In conjunction with this sample collection sequence, two seal tests are performed. The Arm Interspace
44 Seal Test (AIST) occurs at the initiation of a sample sequence. It confirms that the robotic arm has an
45 effective seal on the docking port. The Carrier Interspace Seal Test (CIST) is performed when the carrier
46 has been sealed against the docking port. It confirms that both the robotic arm and the carrier are sealed

1 against the docking port. The CIST occurs prior to lifting the robotic arm off the docking port. The seal
2 tests are performed to ensure that air from the glovebox confinement cannot be drawn into the PTS.

3 The ISOLOK sampler is flushed after sample collection to prevent needle plugging and to prevent cross
4 contamination of subsequent samples. To flush the ISOLOK sampler, the sample vial with a triple
5 septum cap will be repositioned with respect to the discharge needle so that water can be applied at a port
6 that allows flow through the vent needle opening. The septum is punctured by the sample collection
7 needles, and the vial is held in place while activating the flush valve. The sample plunger will be partially
8 extended to align the ISOLOK port for this flush operation, which will continue until water runs clear,
9 generating approximately 250 ml of secondary waste.

10 **4H.2.2.1 Autosampler Secondary Containment and Leak Detection Functions**

11 The ASX samplers in the PTF, HLW and LAW facilities contain both upper and lower secondary
12 containment liners and leak detection systems. The upper containment area is designed to collect a
13 potential leak from the incoming sample feed and return lines where they connect to the ISOLOK
14 sampling device. If a leak occurs in the upper containment area, the leak flows to the sloped liner which
15 diverts the leak to the annular space of the coaxial sample return lines. Leaks flow down the secondary
16 containment pipe and discharge to secondary containment with leak detection, typically a sump with a
17 radar level detector. The ASX sample feed and sample return lines, and the routing of potential leaks in
18 the annular space of the return lines are shown on the associated process system P&IDs provided in
19 Operating Unit Group 10, Appendices 8.2, 9.2, and 10.2.

20 The sloped stainless steel liner in the lower containment area is designed to divert liquids to a sloped
21 collection trough. The trough contains a removable weir that allows liquids to collect and activate the
22 thermal level detection switch and alarms to indicate that a leak has occurred. Effluent from a leak flows
23 to the same drain line that manages ISOLOK flush solutions. The ISOLOK flush lines terminate below
24 the top of the trough drain to ensure that the leak detection system is not activated when flushing the
25 ISOLOK. The ASX lower containment area drain lines are shown on the associated process system
26 P&IDs provided in Operating Unit Group 10, Appendices 8.2, 9.2, and 10.2. Typical autosampler
27 secondary containment design details are provided in the Secondary Containment Design permit
28 document provided in Operating Unit Group 10, Appendix 7.5.

29 The ASX secondary containment liner, liner trough, weir, leak detection instruments, coaxial sample feed
30 and sample return piping make up the secondary containment and leak detection systems for the PTF,
31 HLW and LAW ASX samplers. The balance of the ASX sampler equipment in each facility; the ASX
32 pneumatic sample transfer lines between facilities, and the ASX sample receipt system in the Lab are not
33 part of the ASX secondary containment system, and are excluded from the WTP permit by the sample
34 exclusion [[WAC 173-303-071\(1\)](#)]. ~~ASX upper and lower secondary containment liner dimensions are~~
35 ~~provided in Table 4H-2.~~ Drain line and leak detection instrument design details are provided in
36 [Table 4H-3](#).

37 If a spill occurs in either the upper and lower containment area, these areas can be rinsed. In the upper
38 containment area, a wash wand will be provided to allow for localized wash if required. In the lower
39 containment area, a spray ring and spray wands are provided to rinse this containment area. Wash
40 solutions will be directed to the required location by the operator. Valves mounted externally to the
41 autosampler allow the operator to deliver a wash stream to targeted areas that may require
42 decontamination.

43 **4H.3 Air Emission Control**

44 The analytical laboratory ventilation systems include C1V, C2V, C3V, and C5V systems that aid in the
45 containment and confinement of radiological and hazardous chemical constituents. Clean occupied areas
46 without contamination potential are classified as C1 and will be isolated from areas with the potential for

1 contamination (C2) and from areas with restricted occupancy, normal radiological hazards and higher
 2 contamination potential (C3 and C5).

3 C3 areas are restricted occupied areas and allow operator access under administrative controls as required
 4 for scheduled maintenance and operations. C5 areas have the highest contamination potential and will
 5 normally be unoccupied. These areas have, by virtue of their location and the activities performed within
 6 them, an increased potential for the release of contamination. The design objectives of the analytical
 7 laboratory HVAC system, and therefore the C5 area ventilation system, will be as follows:

- 8 • Aid in the confinement and containment of radiological and hazardous chemical contamination
 9 sources.
- 10 • Remove airborne particulates from the discharge air to ensure that emissions are within
 11 prescribed limits.
- 12 • Maintain space temperatures within the indoor design conditions.
- 13 • Satisfy safety requirements and codes and standards that are a part of the Safety Requirements
 14 Document.

15 The C5V ventilation system, which services the hotcells and the Hotcell Drain Collection Vessel (RLD-
 16 VSL-00165), will be isolated while in the DFLAW configuration.

17 The C5 area ventilation system is being designed to maintain a negative pressure in the C5 areas with
 18 respect to the surrounding areas. Hotcell ventilation, the Hotcell Drain Collection Vessel
 19 (RLD-VSL-00165), and the C3 maintenance shop glovebox will be exhausted to the C5 ventilation
 20 system. Fume hoods within the Rad Labs, the waste reduction and lab pack room, and the C3
 21 maintenance shop will be exhausted to the C3 ventilation system. The ventilation from C2 and C3 areas
 22 will be filtered through a single stage of HEPA filters and exhausted through the analytical laboratory
 23 stacks. Air cascading into the C5 areas from the adjacent C2 and/or C3 areas will be exhausted through
 24 the analytical laboratory building stacks by the C5 exhaust fans after passing through two stages of HEPA
 25 filter banks.

26 **4H.4 Laboratory Maintenance**

27 The analytical laboratory maintenance shop provides space for performing preventive and corrective
 28 maintenance on laboratory equipment. There will be two shops, located in different potential
 29 contamination areas. The C3 shop allows decontamination, maintenance, and storage of contaminated
 30 equipment such as hotcell manipulators. The C3 maintenance shop will be ventilated to the C3
 31 ventilation system, and effluent from the C3 maintenance shop discharges to the Laboratory Area Sink
 32 Collection Vessel (RLD-VSL-00164). The C2 shop will provide space for the maintenance of equipment
 33 that is not expected to be radioactively contaminated such as electrical components, utilities systems
 34 components, and instruments, and will be ventilated to the C2 ventilation system.

35 A list of proposed maintenance activities that will be performed in the analytical laboratory maintenance
 36 shops is provided below.

Analytical Laboratory Maintenance and Waste Management Activity Summary		
Task Description	Lab C3 Shop	In-Situ Activities

Filter change out ^a		X
Manipulator maintenance and repair ^b	X	X
Valve maintenance and repair		X
Pump maintenance and repair	X	X
Exhaust fan maintenance and repair		X
Repair and maintenance of fabricated equipment	X	X
Instrument maintenance and calibration	X	X
<p>a Spent filters will be disposed of following filter changeout using approved maintenance, waste management, and radiological procedures.</p> <p>b Manipulators requiring extensive repairs will be pulled and transferred to the C3 workshop for decontamination. Once the contamination levels are reduced to within acceptable limits for hands-on maintenance, the manipulator will be repaired using approved maintenance and radiological procedures.</p>		

1 **4H.5 Solid Waste Management**

2 Mixed and dangerous solid waste will be accumulated in hotcells and periodically placed in waste drums.
 3 Waste from the individual hotcells will be transferred to a waste management cell where waste
 4 management, consolidation, and packaging activities are conducted. The waste cell contains tools and
 5 equipment to complete size reduction. These solid mixed and dangerous wastes as well as organic lab
 6 pack wastes will be transferred into waste drums prior to being transferred to the laboratory waste drum
 7 management area. Mixed and dangerous solid waste and organic lab pack wastes from the Rad Labs and
 8 maintenance areas will be accumulated in the individual labs and shops until they are transferred to the
 9 laboratory waste management area for waste consolidation and volume reduction. Waste consolidation
 10 will be completed in the volume reduction and lab pack rooms in the waste drum management area.

11 Laboratory secondary solid wastes will be transferred to Hanford site and off-site treatment facilities for
 12 treatment as needed. Treated secondary wastes will be transferred to Hanford site TSD site (Integrated
 13 Disposal Facility or Low-Level Burial Grounds) for disposal. Low-level radioactive wastes will be
 14 transferred to a Hanford site low-level radioactive disposal facility.

15 **4H.5.1 Hotcell Solid Waste Management**

16 Mixed and dangerous solid waste will be accumulated in hotcells and periodically placed in waste drums.
 17 Solid waste management in the hotcell will require remote handling. Waste from the individual hotcells
 18 will be transferred to HC-14 where waste management, consolidation, and packaging activities are
 19 conducted. The waste cell contains tools and equipment to complete size reduction. These wastes will be
 20 transferred into waste drums prior to being transferred to the laboratory waste drum management area.
 21 Hotcell wastes will only be generated in the Baseline configuration.

22 Wastes generated in the hotcell area of the Lab are not packaged in the Waste Drum Management Area.
 23 Packaging and volume reduction of hotcell wastes, including high-activity wastes is completed in HC-14
 24 prior to being transferred to the Waste Drum Management Area for storage.

25 **4H.5.2 Container Storage Area for the Analytical Laboratory**

26 The Lab Container Storage Area is located at the 0’-0” elevation and is referred to as the Waste Drum
 27 Management Area on laboratory facility drawings, and in laboratory system description documents. The
 28 Waste Drum Management Area includes five waste management rooms (139, 139A, B, C &D) located
 29 inside of the Lab facility. Room A-0139, the Waste Drum Management Room, is the primary dangerous
 30 and mixed secondary waste storage room, and is used to provide segregation of wastes. Separation of

1 wastes will be provided to meet the separation distances provided in Uniform Fire Code and applicable
2 sections of [WAC 173-303](#).

3 The potential for precipitation inflow into the area is mitigated by a dry sump located inside the roll-up
4 door on the south side of the airlock/clean drum export area.

5 Segregation and secondary containment for waste drums containing liquids will be provided by
6 commercially available portable spill containment pallets/devices designed to contain 10 percent of the
7 volume of all of the containers within the containment system or the volume of the largest container,
8 whichever is greater. The exterior walls of the waste drum storage area are constructed of reinforced
9 concrete and the entire floor area of the waste drum storage area is coated with a special protective
10 coating. This coating is not designed to provide secondary containment. Coatings are provided to
11 support the clean-up and decontamination of a potential spill.

12 Room A-0139A is equipped with a walk-in fume hood to support the packaging of organic liquids and
13 other lab pack wastes. The room will be used to package and add absorbent to waste packages to comply
14 with Hanford Site Solid Waste Acceptance Criteria (HSSWAC) and/or off-site disposal facility waste
15 acceptance criteria for liquid and lab pack wastes. Room A-0139B is an airlock separating the main
16 waste drum area and the lab pack and volume reduction areas. Room A-0139C is equipped with an
17 in-drum compaction unit design to reduce the volume of low-activity wastes generated in the Rad
18 Lab/ARL areas. Because volume reduction and the packaging of wastes to meet transportation and/or
19 disposal facility waste acceptance criteria is not a permitted activity, manufacturer cut sheets for support
20 equipment in these rooms is not included in the package. The fifth room is Room A-139D, the
21 airlock/clean drum export area. This area is used to provide additional storage, segregation, and
22 management of waste containers prior to transfer to WTP, Hanford Site, or off-site waste disposal
23 facilities.

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Table 4H-1 Analytical Laboratory Tank Systems						
No.	System	Vessel Number/Location	Description	Material	Total Volume (US Gallons)	Approximate Dimensions (Inside Diameter) × Height or Length in feet and inches (tangent line/tangent line)
1	RLD	RLD-VSL-00164 A-B003	Laboratory Area Sink Drain Collection Vessel	6% Mo	3,180	8' 6" x 5' 9"
2	RLD	RLD-VSL-00165 A-B004	Hotcell Drain Collection Vessel	6% Mo	9,100	16' 0" x 2' 3"

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Table 4H-2 Analytical Laboratory <u>Tank Systems</u> Secondary Containment <u>Rooms</u>/Areas				
<u>Room/Area</u>	<u>Approximate Room/Area Dimensions (L×W, in feet)</u>	<u>Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)</u>	<u>Volume of Largest Plant Item in Room/Area (US Gallons)</u>	<u>Minimum Secondary Containment Height (feet)</u>
<u>A-B003 Lab Area Sink Drain Collection Vessel Cell</u>	<u>27ft 3in x 13ft</u>	<u>Laboratory Area Sink Drain Collection Vessel RLD-VSL-00164</u>	<u>3,180</u>	<u>3.8</u>
<u>A-B004 Hot Cell Drain Collection, Vessel Cell</u>	<u>29ft x 21ft</u>	<u>Hot Cell Drain Collection, RLD-VSL-00165</u>	<u>9,100</u>	<u>2.7</u>

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Table 4H-3 Analytical Laboratory Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box or Floor Drain/Line I.D.#, Room, and Elevation	Maximum Sump/Leak Detection Box Capacity (US Gallons)	Sump/Leak Detection Box Level Detection Type	Sump/Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	Piping and Instrumentation Diagram Number
Analytical Laboratory				
Sumps				
RLD-SUMP-00041 A-B003 (C3 Effluent Vessel Cell, El. -18'7")	30	Radar	30" Dia. x 13" Deep Stainless Steel	<u>24590-LAB</u> -M6-RLD-00002001
RLD-SUMP-00042 A-B004 (C5 Effluent Vessel Cell, El. -19'2")	30	Radar	30" Dia. x 13" Deep Stainless Steel	<u>24590-LAB</u> -M6-RLD-00001001
RLD-SUMP-00045 A-B002 (C3 Pump Pit Sump, EL -6'-81/2"LP)	1.60	Radar	2'-0" x 2'-6" x 1/2" Stainless Steel	<u>24590-LAB</u> -M6-RLD-00002003
RLD-SUMP-00043A A-B007 (C5 Pump Pit Sump, EL -6'-7"LP)	1.60	Radar	1'-6" x 3'-0" x 1/2" Stainless Steel	<u>24590-LAB</u> -M6-RLD-00001002
RLD-SUMP-00043B A-B005 (C5 Pump Pit Sump, EL -6'-7" LP)	1.60	Radar	1'-6" x 3'-0" x 1/2" Stainless Steel	<u>24590-LAB</u> -M6-RLD-00001003
RLD-SUMP-00044 A-B006 (C5 Piping Pit Sump, EL -6'-7" LP)	1.60	Radar	2'-0" x 2'-6" x 1/2" Stainless Steel	<u>24590-LAB</u> -M6-RLD-00001004
Leak Detection Boxes				
RLD-LDB-00002 A-B004 (C5 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00008001
RLD-LDB-00004 A-B004 (C5 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00008001

Table 4H-3 Analytical Laboratory Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box or Floor Drain/Line I.D.#, Room, and Elevation	Maximum Sump/Leak Detection Box Capacity (US Gallons)	Sump/Leak Detection Box Level Detection Type	Sump/Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction	Piping and Instrumentation Diagram Number
RLD-LDB-00005 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00007001
RLD-LDB-00006 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00007001
RLD-LDB-00007 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00007001
RLD-LDB-00008 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00007001
RLD-LDB-00009 A-B004 (C5 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00008001
RLD-LDB-00011 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	<u>24590-LAB</u> -M6-RLD-00007001
Drain Lines				
RLD-WU-02207-S11E-04 Drain Line A-B003, (C3 Effluent Vessel Cell, El. -18'7")	N/A	N/A	4" Dia. 316L	<u>24590-LAB</u> -M6-RLD-00002001
RLD-ZN-02203-S11E-04 Drain Line A-B004, (C5 Effluent Vessel Cell, El. -19'2")	N/A	N/A	4" Dia. 316L	<u>24590-LAB</u> -M6-RLD-00001001
RLD-ZN-03393-S11E-04 Drain Line A-B004, (C5 Effluent Vessel Cell, El. -19'2")	N/A	N/A	4" Dia. 316L	<u>24590-LAB</u> -M6-RLD-00001001
RLD-ZN-03394-S11E-04 Drain Line A-B004, (C5 Effluent Vessel Cell, El. -19'2")	N/A	N/A	4" Dia. 316L	<u>24590-LAB</u> -M6-RLD-00001001

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Table 4H-4 Analytical Laboratory Container Storage Areas		
Container Storage Area	Maximum Waste Volume (US Gallons) ¹	Approximate Dimensions (L x W x H, in feet) ²
Analytical Laboratory		
1. Laboratory Waste Management Area (A-0139 and A-0139A/B/C/D)	139,586	49' x 38' x 10'
¹ The conversion factor used to convert from cubic feet to gallons is 7.4805 gal/ft ³ . ² The dimension for height (H) is based on the height of the largest waste container stored in the area (i.e., LAW container is 7.5 ft, HLW canister is 15 ft, melters are assumed to be 16 ft, and a B-25 box is 5 ft - stacked a maximum of two high is 10 ft).		

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