LOW-ACTIVITY WASTE PRETREATMENT SYSTEM
ADDENDUM H
CLOSURE PLAN

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

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H. CLOSURE PLAN

H.1 Introduction

This addendum describes the planned activities and performance standards for closing the Low-Activity Waste Pretreatment System (LAWPS) dangerous waste management units (DWMUs).

Addendum A, "Part A Form" provides contact information, unit description, history, location, layout, and identifies the process codes, design capacities pertaining to the waste inventory for the LAWPS DWMUs. Dimensions, construction details (e.g., materials, as-built drawings, etc.), and associated ancillary equipment and secondary containment are found in Addendum C, "Process Information." The waste types managed in each DWMU (by standard chemical name and waste code) can be found in Addendum A, "Part A Form," and Addendum B, "Waste Analysis Plan." Training requirements are provided in Addendum G, "Personnel Training" inspection requirements are provided in Addendum I, "Inspection Plan," and Security requirements are provided in Addendum E, "Security."

Closure of the LAWPS DWMUs includes the tank systems and associated ancillary equipment, secondary containment system, Spent Ion Exchange Column (IXC) staging area, spent IXC storage pad, and underlying soil. Only areas that have treated, stored, or handled mixed waste will undergo closure activities. The Tank Side Cesium Removal (TSCR) Process Enclosure piping and hose-in-hose transfer lines (HIHTLs) will be flushed, drained and disposed of.

Table H-1. Dangerous Waste Management Units

T01 – Tank Treatment, S02 – Tank Storage, S01 – Container Storage
LAWPS Dangerous Waste Management Units
DWMU #1 encompasses the TSCR process enclosure tank storage and treatment system. This includes the inlet feed filters, IXCs, media trap, delay tank, and all ancillary components (e.g., internal piping, valves, containment system, and HIHTLs).
DWMU #2 encompasses the spent IXC staging area.
DWMU #3 encompasses the spent IXC storage pad.

Note: Pipe-in-Pipe transfer lines are included in the LAWPS Operating Unit Group (OUG) permit application for design and installation only because there is not final status permit for the DST OUG. It is anticipated for operations that these transfer lines will be transferred to a different final status OUG. Closure of these lines will be performed by the OUG they are assigned to for operation in a future permit modification.

Clean closure of the LAWPS DWMUs will provide for decontamination or removal and disposal of all dangerous waste, waste residues, contaminated equipment, soil, or other material established in accordance with the clean closure performance standards of Washington Administrative Code (WAC) 173-303-610(2). This and future closure plan revisions will provide for compliance with these performance standards. All work will be performed As Low as Reasonably Achievable (ALARA) with respect to worker exposure to dangerous and/or any other workplace hazards. Activities that are planned to achieve clean closure are presented in the following sections.

H.1.1 Maximum Extent of Operations

The maximum extent of operations during the active life of TSCR corresponds to the maximum mixed waste inventory with full tanks and ancillary equipment operating at maximum design capacity and the total number of spent IXCs generated during operation.

An estimated 14,725 tons of waste feed will be processed through TSCR annually. The total combined tank storage capacity at any given time is a nominal 300 gallons. In addition, the TSCR IXC staging area and storage pad will accommodate an estimated 450 tons of spent IXCs annually. Refer to Addendum A, "Part A Form" for additional details.

Addendum C, "Process Information" provides dimensions and drawings showing the locations of the DWMUs, including the tank systems and ancillary equipment, and structures and equipment.

H.1.2 Health and Safety Requirements During Closure

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform closure activities in compliance with established safety and environmental procedures. All work will be performed ALARA with respect to worker exposure to dangerous waste and/or any other workplace hazards. Personnel will be equipped with appropriate personal protective equipment. Qualified personnel will be trained in applicable safety and environmental procedures and have appropriate training in decontamination activities. Field operations will be performed in accordance with applicable health and safety requirements. If an emergency occurs, the on-call Building Emergency Director will be notified, and the requirements associated with Addendum J, "Contingency Plan" will be implemented.

H.2 Closure Performance Standards

The LAWPS DWMUs will be closed in accordance with the general closure performance standard in WAC 173-303-610(2)(a), by decontamination or removal as provided for in this plan to achieve clean closure. The LAWPS system will be closed in a manner that: minimizes the need for further maintenance; controls, minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere; and returns the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity.

For the purposes of LAWPS closure, the items listed in Table H-1 will meet the clean debris surface standard in 40 Code of Federal Regulations (CFR) 268.45, incorporated by reference in WAC 173-303-071(3)(qq), or be removed. Attainment of a clean debris surface can be verified visually in accordance with the standard (40 CFR 268.45) that states:

> "A clean debris surface" means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations and soil and waste in cracks, crevices, and pits may be present provided that such staining and waste and soil in cracks, crevices, and pits shall be limited to no more than 5% of each square inch of surface area."

H.2.1 Closure Standards for Concrete

The performance standard for concrete is a clean debris surface. The clean closure decontamination standards for concrete are those specified for hazardous debris in 40 CFR 268.45, Table 1. The concrete that does not have a clean debris surface will be treated using "Water Washing and Spraying" treatment technology of 40 CFR 268.45, Table 1; and if necessary, additional more aggressive decontamination methods until a clean debris surface is obtained. To minimize waste volume and the possibility of releases, decontamination will utilize low-pressure application of the decontamination solution followed by manual scrubbing and rinsing. Any surfaces that do not meet the clean debris surface standard following the initial decontamination will be re-cleaned using one or more of the following methods: scarification, grinding, and plaining using rotating grinding wheels or other mechanical means of physically removing surface layers; or vibratory finishing.

In the unlikely event that structures cannot be cleaned using the methods described, these structures will be demolished, removed, and managed as dangerous waste. If it is determined that soil contamination is possible, the soil will be decontaminated (see Section H.2.4), and the investigation and cleanup of the soils will be managed in accordance with WAC 173-303-610(2)(b).

H.2.2 Closure Standards for Tank Systems

The closure standard for tank systems and associated ancillary equipment is a clean debris surface standard using 40 CFR 268.45, incorporated by reference by WAC 173-303-140, and can be declared non-dangerous in accordance with WAC 173-303-071(3)(qq).

The tank systems and ancillary equipment will be decontaminated in accordance with Section H.3.3. If it is not possible to meet the clean debris surface standard, for the tank systems and associated ancillary equipment, the components of concern will be removed, treated as necessary to comply with land disposal restrictions (LDRs) [40 CFR 268, incorporated by reference by WAC 173-303-140], to achieve clean closure.

For tank systems and associated ancillary equipment where the contaminated surfaces can be visually inspected, an inspection will be performed to see if the ancillary equipment meets the clean debris surface standard. If safe physical access is not available to perform visual inspection to determine whether the clean debris surface standard is met, other technologies such as remote operated cameras may be used.

H.2.3 Closure Standards for Container Storage

Closure of the LAWPS IXC storage areas will entail complete removal and disposition of the spent IXCs. Following column removal, the IXC staging area and IXC storage pad will be inspected to ensure no dangerous waste residues remain (refer to Section H.2.1). Because the spent IXCs contained no free liquids and given the highly radioactive properties of the IX media contained within, radiological surveys combined with a visual inspection are determined to be sufficient following removal of the containers.

Any dangerous and/or mixed-waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

In support of determining a final disposition pathway for cesium, which currently exists in the Double-Shell Tanks (DSTs), United States Department of Energy (DOE) will continue to evaluate potential options available. To ensure waste streams have a disposal pathway, DOE and Department of Ecology (Ecology) will conduct workshops to identify what is known about column and crystoline silicotitane (CST) media treatment and disposal. From this effort, it is anticipated that a project plan Tri-Party Agreement milestone would be developed for the disposition the spent IXCs. The evaluation will consider (1) current laws and regulations that affect disposal pathways, (2) potential changes to laws and regulations, (3) existing and reasonably possible options for the disposal of the IXCs and CST, (4) comparison of the baseline disposal scenario (i.e. vitrification at Waste Treatment Plant [WTP]) and alternative disposal pathways, (5) capability to vitrify the CST at WTP, and (6) comparison of the baseline interim storage scenario with alternative storage options, including shipment to a permitted treatment and storage facility off the Hanford Site.

H.2.4 Closure Standard for Focused Soil Sampling

The closure standard for the LAWPS soil sampling uses WAC 173-340-740(3), Model Toxics Control Act-Cleanup (MTCA) *Unrestricted land use soil cleanup standards* Method B that considers human health based on direct soil contact. The closure performance standards are provided in Section H.2.

H.3 Closure Activities

Prior to notification of closure [WAC 173-303-610(3)(c)], the closure plan will be modified as necessary to reflect current regulations and information. If the Permittee determines that clean closure is not possible, the closure plan will be modified.

Closure of the LAWPS OUG will include removal of accumulated liquid waste (i.e., liquid remaining from treatment campaigns) by transferring the waste to the DST System, Liquid Effluent Retention Facility (LERF), and/or another authorized dangerous waste facility. After the waste has been removed, and DWMUs in Table H-1 have been inspected, decontaminated, clean closure will be accomplished by demonstrating that the closure performance standards are met in accordance with WAC 173-303-610. Clean closure of the soil will be accomplished by conducting a review of the operating record spill history, and demonstrating that the secondary containment (concrete and liner) prevented contaminants from reaching the soil.

If it is determined that soil contamination is possible, investigation and cleanup of the soils will also be managed in accordance with WAC 173-303-610(2)(b).

Ancillary equipment between the TSCR system and the 241-AP Tank Farm consists of HIHTLs. HIHTLs will be dispositioned at closure by removal, designation, and disposal in accordance with WAC 173-303-610(5). Closure of both IXC storage areas will be performed in accordance with Section H.2.3.

H.3.1 Removing of Waste and Waste Residues

All of the dangerous waste inventory within the TSCR Process Enclosure will be processed before closure following normal operating procedures. In addition, the tank systems components will be flushed as part of final processing to remove the waste and waste residues. Waste residues remaining after processing will be consistent with the wastes previously processed; as such, the residues will have the same dangerous waste codes. Residues will be removed by flushing and transferring the waste back to the DST System.

Closure of the LAWPS IXC storage pads will entail complete removal and disposition of the spent IXCs.

H.3.2 Operating Record Review and Visual Inspection

After wastes and waste residues are removed, each DWMU will be evaluated for historical spills or other releases of dangerous or mixed wastes by review of the LAWPS operating record and by visual inspection. The review will include the following operating record documents: facility operating logbooks (including spill reports), integrity assessment reports, and waste management inspection and surveillance records.

Concrete beneath the TSCR Process Enclosure and both IXC storage areas will be inspected visually and surveyed radiologically before any decontamination will be performed. The purpose of the inspection is twofold: identify and document any cracks in the concrete that might have allowed contaminants a pathway to the underlying soil, and identify areas that potentially are contaminated with dangerous waste or dangerous waste residues.

H.3.3 Decontamination

Decontamination of the concrete and metal surfaces will be performed using the decontamination standards specified for hazardous debris in 40 CFR 268.45, Table 1. The surfaces will be inspected visually and radiologically surveyed before any decontamination. The concrete and metal surfaces that do not have a clean debris surface will be treated using "Water Washing and Spraying" treatment technology of 40 CFR 268.45, Table 1; and if necessary, additional more aggressive decontamination methods until a clean debris surface is obtained. Decontamination will initially utilize detergent and surfactant solutions (product will be identified based on the nature of the staining, and utilized in accordance with manufacturer's instruction). The product, concentration used, and residence time of

application will be documented in the clean closure certification. To minimize waste volume and the possibility of releases, decontamination will utilize low-pressure application of the decontamination solution followed by manual scrubbing and rinsing. Any surfaces that do not meet the clean debris surface standard following the initial decontamination will be re-cleaned using one or more of the physical extraction techniques until the standard is met; or the contaminated portions will be removed, designated, and disposed of at an authorized dangerous waste facility.

The inspections for a clean debris surface will be documented on an inspection record. Decontamination residues will be collected, designated, and transferred to the LERF or another authorized dangerous waste facility.

H.3.3.1 Tanks and Ancillary Equipment

In accordance with WAC 173-303-640(8), all waste from tank system components will be removed. Prior to decontamination, where it is possible to inspect visually, a visual inspection will be performed; where it is not possible to inspect visually beneath the tank system components, an evaluation of the tank system integrity will be made. The evaluation will determine the condition of the tank system, and determine whether there was any potential for leakage. If no cracks, severe corrosion, repairs, or evidence of leaks is observed, it will be reasoned that mixed or dangerous waste solutions could not have penetrated to the soil directly below TSCR Process Enclosure.

The tank system ancillary equipment will be flushed as part of closure. The tank system equipment will be decontaminated to meet the clean debris surface standard using the decontamination methods described in Section H.3.3. If decontamination by the proposed methods or visual inspection to confirm the clean debris surface performance standards are not possible, the particular component will be removed, designated, treated if necessary, and disposed of at an authorized dangerous waste facility, in accordance with 40 CFR 268, incorporated by reference by WAC 173-303-140, to achieve clean closure. Following decontamination of the tank system ancillary equipment will be inspected to determine if the surfaces meet the clean debris surface standard in 40 CFR 268.45, incorporated by reference by WAC 173-303-140, and can be declared non-dangerous in accordance with WAC 173-303-071(3)(qq).

HIHTLs will be removed and disposed of. Waste disposed of during closure activities will meet the waste acceptance criteria for the accepting authorized dangerous waste facility. Removal of any dangerous wastes or dangerous constituents generated during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

H.3.3.2 Contaminated Environmental Media

The design of the LAWPS DWMUs is intended to prevent the release of dangerous waste to the soil. Clean closure of the soil under the LAWPS DWMUs will be accomplished by demonstrating that the TSCR Process Enclosure secondary containment has not lost integrity; and has therefore prevented contaminants from reaching the soil.

Clean closure of soil under IXC storage areas will be accomplished by demonstrating that concrete pads kept contaminants from reaching the soil. Unless inspections identify potential through-thickness cracks indicating failure and a subsequent potential for soil contamination from TSD unit operations, the soil will be considered clean closed. However, if inspections identify such cracks and there have been documented spills in the vicinity, potential soil contamination will be investigated. It is acknowledged the TSCR Process Enclosure, the IXC Staging Area, and IXC storage pad will be constructed over, and in proximity to several 200-IS-1 Operable Unit waste sites. As a result of installation of the IXC storage pad, a portion of Waste Information Data System (WIDS) pipeline sites 200-E-232-PL and 200-E-127-PL-B will be removed as an interference. Modifications to both waste sites as a result of the storage pad construction will be documented and the WIDS records for each waste site and updated accordingly. In addition, an approximate 100-foot length of waste site pipelines 200-E-127-PL-B and

200-E-187-PL will lie beneath the concrete LAWPS IXC travel path, which represents an interim interference to their remediation.

Focused sampling will be performed in the vicinity of any identified secondary containment defects, or in the known or suspected release location. If the soil analytical results determine that the constituents in Table H-2 are at or below the risk-based concentration limits for soil [WAC 173-303-610(2)(b)(i)], the soil will be considered clean closed. If the constituents exceed the numeric cleanup levels, the soil will be removed based on the areal and vertical extent of contamination, followed by additional confirmatory sampling. If the soil concentrations are less than or equal to risk-based soil standards for the constituents, the soil is clean closed. If not, and the contamination is limited and removable, the contaminated soil will be removed to meet risk-based concentration limits for soil, followed by additional confirmatory sampling at the limits of the excavation to confirm adequate removal WAC 173-303-610(2)(b). If the risk-based concentration limits for soil cannot be met, then the Permittees will meet with Ecology to determine a path forward for closure.

H.3.4 Waste Generated During Closure

Rinsate generated during decontamination will be returned to the DST System or disposed of through LERF and 200 Area Effluent Treatment Facility (ETF). Soil and debris generated during closure will be containerized, labeled, and characterized in accordance with WAC 173-303-610(5).

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation.

H.4 Sampling and Analysis Plan and Constituents to be Analyzed

Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure sampling and analysis plan (SAP).

If the review and/or inspections identify a loss of secondary containment integrity, where there is evidence that contamination may have leaked into the soil below the TSCR Process Enclosure or concrete storage areas, the concrete will be drilled or removed to allow the underlying soil to be sampled to determine the depth of the contamination. Focused sampling will be performed in the vicinity of identified contamination, secondary containment defects, or in the known or suspected release location.

If the soil analytical results determine that the constituents in Table H-2 are at or below the risk-based concentration limits for soil [WAC 173-303-610(2)(b)(i)], the soil will be considered clean closed. If the constituents in Table H-2 exceed the numeric cleanup levels, the soil will be removed based on the areal and vertical extent of contamination, followed by additional confirmatory sampling. If the soil concentrations are less than or equal to risk-based soil standards for the constituents in Table H-2 the soil is clean closed. If not, and the contamination is limited and removable, the contaminated soil will be removed to meet risk-based concentration limits for soil, followed by additional confirmatory sampling at the limits of the excavation to confirm adequate removal WAC 173-303-610(2)(b). If the risk-based concentration limits for soil cannot be met, then the Permittees will meet with Ecology to determine a path forward for closure [WAC 173-303-640(8)(b)].

H.4.1 Sampling and Analysis Plan Requirements

The objective of the sampling described in this document is to determine if the closure performance standards for soil (Section H.2.4) established in this closure plan pursuant to WAC 173-303-610(2)(b)(i) have been satisfied, demonstrating clean closure of the soil in the vicinity of the transfer piping wall penetrations.

The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; and the American Society for Testing and Materials (ASTM) *Annual Book of ASTM Standards*. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, and Environmental Protection Agency (EPA)-approved methods at the time of closure.

H.4.1.1 Sampling and Analysis Schedule

Closure sampling and analysis will be performed in accordance with the closure schedule located in Table H-4.

H.4.1.2 Field Sampler Training/Certification

Training records of field samplers are maintained by the sampling organization, retained in the electronic training record database, or archived with operating records. Field samplers will be collecting focused samples of the soil beneath the concrete for analysis to determine if closure performance standards have been achieved.

H.4.1.3 Sampling Documents and Records

Logbooks (electronic or hardcopy) are required for field activities. A logbook must be identified with a unique project name and number, and the logbooks can be retained on electronic media. The individual(s) responsible for logbooks will be identified in the logbook, and the responsible individual will sign the logbook. Only authorized persons may make entries in logbooks. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The project file will contain the following records or references to their storage locations:

- Field logbooks or operational records.
- Global positioning system data.
- Sample authorization forms.
- Chain of custody (COC) forms.
- Sample receipt records.
- Inspection or assessment reports and corrective action reports.
- Interim progress reports.
- Final reports.
- Laboratory data packages.
- Data verification and validation reports.

The contract analytical laboratory is responsible for maintaining, and having available on request, the following:

- Analytical logbooks.
- Raw data and quality control (QC) sample records.
- Standard reference material or proficiency test sample data.
- Instrument calibration information.

H.4.1.4 Sampling Design and Analysis

The primary purpose of sampling the soil, if necessary, at focused sample locations is to determine if analytical results exceed closure performance standards (refer to Table H-2).

Focused sampling is selective sampling of areas where contamination is expected or releases have been documented. Selection of focused sampling units (i.e., the number and location of samples) is generally based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability-based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. The use of statistical evaluation for focused data is not possible. Any focused data must be reviewed directly against the closure performance standards as to whether they are above or below the standards.

The presumed exposure pathways that were considered for LAWPS DWMU closure are:

- WAC 173-340-740(3), Model Toxics Control Act-Cleanup *Unrestricted land use soil cleanup standards* Method B (cancer and noncancer) that considers human health based on direct soil contact.
- WAC 173-340-740, Table 740-1, "Method A soil cleanup levels for unrestricted land use," which includes soil closure performance standards for human health based on unrestricted land use. MTCA Method A is only used if MTCA Method B is not available in the Cleanup Levels and Risk Calculation tables.
- WAC 173-340-740, *Deriving soil concentrations for groundwater protection* that notes soil concentrations protective of groundwater.

Of the exposure pathways listed above, MTCA Method B direct soil contact, or Method A as applicable, is always considered a complete and viable exposure pathway for all soil samples. The exposure pathway for soil levels protective of groundwater assumes that water or rainwater on a surface has an avenue to percolate through the surface and underlying soil to groundwater. Of the viable exposure pathways, the most conservative closure performance standard is selected. Per WAC 173-340-740(5)(c), the closure performance standard value cannot be below the laboratory practical quantitation limit (PQL).

Soil sampling and analysis will be conducted in accordance with the approved closure plan SAP (Section H.4). Analytical results of the focused sample will be individually compared to closure performance standards in a manner consistent with closure requirements [WAC 173-303-610(2)(b)(i)].

The target analytes considered for evaluation during closure sampling and analysis will be determined by reviewing the waste management records associated with TSCR operations and sample data from DST feed tanks. Table H-2 provides the closure performance standards for soil for each individual target analyte. If target analytes are found above closure performance standards, then the Permittees will meet with Ecology to determine a path forward for closure [WAC 173-303-640].

The constituents of concern identified in Table H-2 are based on waste codes TSCR is permitted to accept, Toxic Substances Control Act (TSCA) Risk-Based Disposal Approvals, and recent sampling.

Table H-2. Closure Performance Standards for Soil and Analytical Performance Requirements

CAS Number	Waste Code	Analyte	Closure Performance Standards	
			Value[a]	Basis
SW-846, Method 6010 Metals			**Accuracy Requirement ±20% Recovery[b] Precision Requirement ≤35 RPD[c]**	
7440-38-2	D004	Arsenic	2.00+01	Background level
7440-39-3	D005	Barium	1.65E+03	Groundwater Protection Calculated using WAC 173-340-747(4)
7440-43-9	D006	Cadmium	6.90E-01	Groundwater Protection
7439-92-1	D008	Lead	250	Method A Soil Level
7782-49-2	D010	Selenium	5.2	Groundwater Protection Calculated using WAC 173-340-747(4)
7440-22-4	D011	Silver	1.36E+01	Groundwater Protection Calculated using WAC 173-340-747(4)
SW-846, Method 7196 Chromium, Hexavalent			**Accuracy Requirement ±20% Recovery[b] Precision Requirement ≤35 RPD[c]**	
18540-29-9	D007	Chromium (Hexavalent)	18.4	Groundwater Protection
Sw-846, Method 7471 Mercury			**Accuracy Requirement ±20% Recovery[b] Precision Requirement ≤35 RPD[c]**	
7439-97-6	D009	Mercury	2.0	Human Health – Direct Contact (noncancer)
SW-846, Method 8082 Polychlorinated Biphenyls			**Accuracy Requirement ±20% Recovery[b] Precision Requirement ≤35 RPD[c]**	
1336-36-3	N/A	PCBs (total)	0.271	Groundwater Protection Calculated using WAC 173-340-747(4)
12674-11-2		Aroclor-1016	2.4	
11097-69-1		Aroclor-1254	0.114	
79-01-6		Aroclor-1260	0.5	
SW-846, Method 8260 Volatile Organics			**Accuracy Requirement ±30% Recovery[b] Precision Requirement ≤20 RPD[c]**	
67-64-1	F003 D001	Acetone	2.89E+01	Groundwater Protection
71-43-2	D018	Benzene	2.82E-02	Groundwater Protection
56-23-5	F001 F002 D019	Carbon tetrachloride	4.60E-02	Groundwater Protection
67-66-3	D022	Chloroform	7.5E-02	Groundwater Protection
107-06-2	D028	1,2-Dichloroethane	2.32E-02	Groundwater Protection
75-35-4	D029	1,1-Dichloroethylene	5.01E-02	Groundwater Protection
121-14-2	D030	2,4-Dinitrotoluene	1.67E-03	Groundwater Protection
87-68-3	D033	Hexachlorobutadiene	6.05E-01	Groundwater Protection

Table H-2. Closure Performance Standards for Soil and Analytical Performance Requirements

CAS Number	Waste Code	Analyte	Closure Performance Standards	
			Value[a]	Basis
78-93-3	F005 D035	Methyl ethyl ketone	1.97E+01	Groundwater Protection Calculated using WAC 173-340-747(4)
108-10-1	F003	Methyl isobutyl ketone	2.73	Groundwater Protection Calculated using WAC 173-340-747(4)
75-09-22	F001 F002	Methylene chloride	2.18E-02	Groundwater Protection
79-01-6	F001 F002 D040	Trichloroethylene	2.64E-02	Groundwater Protection
71-55-6	F001 F002	1,1,1-Trichloroethane	1.58	Groundwater Protection
75-01-4	D043	Vinyl chloride	1.83E-03	Groundwater Protection
67-72-1	D034	Hexachloroethane	4.36E-02	Groundwater Protection
SW-846, Method 8270 Semi-Volatile Organics			**Accuracy Requirement ±30% Recovery[b] Precision Requirement ≤30 RPD[c]**	
51-28-5	N/A	2,4-Dinitrophenol	1.28E-01	Groundwater Protection
108-39-4	F004	m-Cresol	4.0	Groundwater Protection Calculated using WAC 173-340-747(4)
95-48-7	F004	o-Cresol	2.33	
106-44-5	F004	p-Cresol	8.0	
98-95-3	D036	Nitrobenzene	1.02E-01	Groundwater Protection
62-75-9	N/A	N-Nitrosodimethylamine	3.8E-06	Groundwater Protection Calculated using WAC 173-340-747(4)
110-86-1	D038	Pyridine	4.36E-02	Groundwater Protection Calculated using WAC 173-340-747(4)
95-95-4	D041	2,4,5-Trichlorophenol	2.88E+01	Groundwater Protection

[a]Screening levels considered when developing closure performance standards were drawn from MTCA (WAC 173-340-740, Model Toxics Control Act-Cleanup, *Unrestricted land use soil cleanup standards*) (Ecology, 2015, Cleanup Levels and Risk Calculation (CLARC) Tables, July 2015 data tables are most recent), and as noted calculated using WAC 173-340-747(4), Fixed Parameter Three-Phase Partitioning Model. MTCA Method B values represent both cancer and noncancer human health risk values from direct soil contact. The most conservative value is listed. Method A values are substituted when MTCA Method B values are not provided in the CLARC tables.

[b]Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples is also performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analysis.

[c]Determined by the laboratory based on historical data or statistically derived control limits. Limits are reported with the data. Where specific acceptance criteria are listed, those acceptance criteria may be used in place of statistically derived acceptance criteria.

Reference: SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V.

CAS = chemical abstracts service.

PQL = practical quantitation limit.

RPD = relative percent difference.

H.4.1.5 Sampling Methods and Handling

The sample matrix will consist of soil collected in clean sample containers. Soil will be collected at a depth of no more than 6 inches below ground surface, unless staining or discoloration indicates contamination is below that depth. Once the soil is collected, it will be screened to remove material larger than approximately 0.08 inches in diameter, which allows for a larger surface area to volume ratio. This ratio increases the likelihood of identifying any potential contamination in the sample.

To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Preparation and review of sampling paperwork such as COC or labels.
- Sample container and equipment preparation.
- Field walkdown of sample area (includes marking sample location).
- Sample collection.
- Sample packaging and shipping.

These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sample authorization form and the COC form.

A sampling and data-tracking database is used to track the samples from the point of collection through the laboratory analysis process. Sampling and data-tracking database sample numbers will be issued to the sampling organization for the project. Each sample is identified and labeled with a unique sampling and data-tracking database sample number.

To prevent potential contamination of the samples, clean equipment will be used for each sampling activity. Level I EPA pre-cleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory-specific volumes/requirements for meeting the PQL.

The date and time of sample collection, and the sample location, depth, and corresponding sampling and data-tracking database numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container (except for volatile organic analysis [VOA] sample containers) or the sample collection package in such a way as to indicate potential tampering. The custody seal will be inscribed with the sampler's initials and date. Custody tape is not applied directly to VOA sample containers based on the potential for affecting analyte results or fouling of laboratory equipment. Alternatively, VOA vials are placed in a sealable plastic bag affixed with custody seals and any other required labels/documentation.

Data verification and validation will also note any issues with sample collection and analysis. Each sample container will be labeled with the following information on firmly affixed, water-resistant labels:

- Sample authorization form number.
- Sampling and data-tracking database number.
- Sample collection date and time.
- Sampler identification (e.g., initials).
- Analysis required.
- Preservation method (if applicable).
- COC identification number.

In addition to the container label information, sample records must include the following information:

- Sample location.
- Matrix (soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure maintenance of sample integrity throughout the analytical process. COC protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure sample integrity is maintained. A COC record is initiated in the field at the time of sampling and will accompany each set of samples shipped to any laboratory. At a minimum, the following information must be identified on a completed COC record:

- Collector(s) names.
- Project designation.
- Unique sample numbers.
- Date, time, and location (or traceable reference thereto) of sample collection.
- Chain of possession information (i.e., signatures/printed names of all individuals involved in the transfer of sample custody and storage locations, dates of receipt and relinquishment).

Additional information regarding the sample and specific analytical instructions may also be documented.

Discrepancies with the sample material (unusual color, texture, or odor), collection techniques, containers, or transfer packages are noted in the field logbook, communicated with the project manager, and corrective actions are initiated. For instance, where a custody seal is damaged or missing, each case is individually reviewed for usability of the sample. The damaged or missing seal and action taken will be documented in the final data package. Data verification and validation will also note any issues with sample collection and analysis.

Newly generated waste resulting from sampling activities will be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

H.4.1.6 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

If sampling and analysis of the soil indicates contamination above the soil closure performance standards, then Permittees will meet with Ecology to determine a path forward for closure [WAC 173-303-640].

H.4.1.7 Analytical Methods

All analyses and testing will be performed consistent with this closure plan, laboratory contracts, and laboratory analytical procedures at the time of closure. The contracted analytical laboratory must achieve the lowest PQLs consistent with the selected analytical method in order to confirm that the closure performance standards are achieved.

H.4.2 Quality Control

QC procedures must be followed in the field and laboratory to ensure that reliable data are obtained. Field QC samples will be collected to evaluate the potential for cross-contamination and provide information pertinent to field sampling variability. Field QC samples include the following:

- Field trip blanks.
- Field transfer blanks.
- Equipment rinsate blanks.
- Field duplicates.

Laboratory QC samples estimate the precision and bias of the analytical data. Laboratory QC samples include the following samples:

- Method blanks.
- Laboratory duplicates.
- Matrix spikes.
- Matrix spike duplicates.
- Surrogates.
- Laboratory control samples.

Field and laboratory QC samples are summarized in Table H-3.

Table H-3. Project Quality Control Sampling Summary

QC Sample Type	Frequency	Characteristics Evaluated
Field QC		
Field Trip Blanks	One per 20 samples and minimum of one per decision unit.	Field trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Transfer Blanks	One per day that volatile organic compounds are sampled.	Field transfer blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	One per 20 samples per analytical method.	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures. Equipment rinsate blanks are not required if only disposable equipment is used, or if rinsing between samples is not practical (e.g., core drilling equipment).
Field Duplicates	One per 20 samples with a minimum of one per decision unit.	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and the site heterogeneity.
Laboratory QC*		
Method Blanks	One per batch.	Method blanks measure contamination associated with laboratory sample preparation and analysis.
Laboratory Duplicates	One per laboratory analytical batch.	Laboratory duplicates measure laboratory reproducibility and precision.
Matrix Spikes	One per laboratory analytical batch.	The matrix spike recovery measures the effects of interferences in the sample and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per laboratory analytical batch.	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.

Table H-3. Project Quality Control Sampling Summary

QC Sample Type	Frequency	Characteristics Evaluated
Surrogates	Added to each sample and QC (laboratory and field) sample.	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance, and extraction efficiency.
Laboratory Control Samples	One per laboratory analytical batch.	The laboratory control sample measures the accuracy of the analytical methods.

*Batching across projects is allowed for similar matrices.
QC = quality control.

H.4.2.1 Data Review, Verification, Validation, and Usability Requirements

Analytical results will be received from the contract analytical laboratory, loaded into a sampling and data-tracking database, and verified in accordance with Section H.4.2.2. A total of 5 percent of the data will be validated as described in Section H.4.2.3.

H.4.2.2 Data Verification

Verification activities ensure analytical data in the database were properly uploaded and reflect the contract laboratory program equivalent data packages. The steps outlined below will consider both the primary and QC samples. Activities may include, but are not limited to, the following:

- Amount of data requested matches the amount of data received (number of samples for requested methods of analytes).
- Correct procedures/methods are used.
- Issues with sample collection and analysis are noted.
- Documentation/deliverables are complete.
- Hard copy and electronic versions of the data are identical.
- Data seem reasonable based on analytical methodologies.

H.4.2.3 Data Validation

The contract analytical laboratory supplies the equivalent of contract laboratory program analytical data packages intended to support data validation by the third party. These data packages are supported by QC test results and raw data. Data validation considers both primary and QC samples, and considers issues with sample collection and analysis.

Controls are in place to preserve the data sent to the validators, such as allowing only additions to be made, not changes to the raw data. The format and requirements for data validation activities are based on the most current version of EPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and EPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the analytical results will undergo Level C validation.

H.4.2.4 Revisions to the Sampling and Analysis Plan and Constituents to be Analyzed

Changes to the SAP may be necessary due to unanticipated events during closure. An unanticipated event would be an event outside the scope of the SAP or a condition that inhibits implementation of the sampling as written. Any revision to the SAP will be submitted no later than 30 days after an unanticipated event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830(4).

H.5 Confirmation and Certification of Closure Activities

- Closure certification is performed by an Independent Qualified Registered Professional Engineer (IQRPE) per Section H.5.2. Certification will be submitted to Ecology in a manner consistent with Section H.5.3. Conditions of the DWMU after closure are described in Section H.5.4.

H.5.1 Confirmation of Clean Closure

The LAWPS system completion of clean closure will be confirmed by inspection and collection of supporting documentation, including field notes, photographs, and results from sample analysis.

- Removal of dangerous waste and decontamination waste.
- Decontamination of metal, tanks, and concrete surfaces will be verified by visual inspection of the surfaces. Visual inspection will confirm that the decontamination activities have achieved the clean debris surface treatment standard, as stated in 40 CFR 268.45, Table 1.

Analysis results from focused soil sampling performed will be used to confirm that dangerous waste constituents from operation of the LAWPS system are below the closure performance standards (Section H.2).

H.5.2 Role of Independent Qualified Registered Professional Engineer

An IQRPE will be retained to provide certification of the closure as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with clean closure of the LAWPS OUG. At a minimum, the following field activities would be completed:

- Review TSCR visual inspection documentation.
- Observe or review decontamination of concrete surfaces.
- Verify that the concrete surfaces meet the clean debris surface standards.
- Observe or review sampling activities.
- Verify that locations of samples are as specified in the SAP.
- Review sampling procedures and results.
- Observe or review contaminated environmental debris removal (as applicable).
- Observe or review newly generated waste management and disposition records.
- Verify that closure activities were performed in accordance with this closure plan.

The IQRPE will record observations and reviews in the closure certification, which will then be provided to Ecology.

H.5.3 Certification of Closure

Within sixty days of completion of closure of each dangerous waste management unit, the owner or operator will submit to Ecology, by registered mail or other means that establish proof of receipt (including applicable electronic means), a certification that the dangerous waste management unit, has been closed in accordance with the specifications in the approved closure plan. The certification will be signed by the owner or operator and by an IQRPE. Documentation supporting the IQRPE's certification will be furnished to Ecology upon request.

H.5.4 Conditions that will be Achieved when Closure is Complete

When closure is complete, LAWPS DWMUs will not have dangerous waste left onsite at levels above the clean closure performance standard for decontamination and removal.

The closure plan may also be revised before the start of closure work, based on relevant information from the operational history of the TSCR system and the other DWMUs within the LAWPS OUG, advances in decontamination technology, newly designated dangerous waste, deviation from the SAP provided in this Closure Plan.

H.6 Schedule for Closure

Closure of LAWPS has not been determined. The actual year of closure will depend on the time required for current waste to be processed through WTP Low-Activity Waste (LAW) in the Direct Feed Low-Activity Waste (DFLAW) mission configuration. Other factors affecting the year of closure include changes in operational requirements, lifetime extension upgrades, and unforeseen factors. When a definite closure date is established, a revised closure plan will be submitted to Ecology. At least 45 days prior to the date on which closure of one or more DWMUs is expected to begin; a notification for closure will be submitted to Ecology in writing. [WAC 173-303-610(3)(c)(i)]

Table H-4. Closure Schedule

Activity	Duration (Days)
Develop operations protocol for closure activities.	180
Receipt of final volume of mixed waste.	125
Processing of last batch of waste feed.	60
Notify Ecology of intent to begin closure.	30
Records review and visual inspection of structural surfaces, equipment, and tank systems to identify areas of contamination and to determine levels and methods of decontamination required.	90
Flush and decontaminate structural surfaces, equipment, and tank systems.	100
Remove equipment/structures that could not be successfully decontaminated.	180
Visual inspection and/or sample and analyze as required.	180
Removal of decontamination residue.	100
Dispose of waste resulting from decontamination based on results of waste analyses.	125
Submit certification of closure to Ecology (within 60 days of completion of final closure activities).	90
Total Duration	1260

Note: Some activities can be perform in parallel.

H.6.1 Extension of Closure Time

An extension of the closure time is requested for the LAWPS DWMUs. The extended closure period exceeding the 180 days given in WAC 173-303-610(4)(b), is needed to accomplish complex work, while performing the work safely within radiological exposure issues. Decontamination is slow and labor-intensive operation, even after radiological exposure issues have been reduced enough to allow personnel entry, work is hampered by the extensive personal protective equipment staff are required to wear, and the strict procedures that are enforced to protect both workers and the environment from contamination.

H.7 Closure Plan Revisions

Clean closure is the goal for the LAWPS DWMUs. The closure plan will be revised and submitted for approval in accordance with the modification procedures of WAC 173-303-830, if efforts to achieve the clean closure standards cannot be achieved. If an unexpected event has occurred, which has affected the closure plan, a Permit modification including a copy of the amended closure plan will be submitted no later than 60 days after the unexpected event.

Previous spills and subsequent cleanup will be identified and documented in the LAWPS portion of the facility operating record and addressed at the time of closure. A permit modification is required within 60 days when a release occurs that requires modification of the closure plan.

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