# WASTE TREATMENT AND IMMOBILIZATION PLANT
# CHAPTER 3C
# WASTE ANALYSIS PLAN FOR THE DFLAW CONFIGURATION
## 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 |
|---|---|
| 11/19/2024 | 24590-WTP-PCN-ENV-24-002 (8C.2024.Q4) |
| 02/01/2024 | 24590-WTP-PCN-ENV-23-005 (8C.2024.Q1) |
| 05/26/2022 | 24590-WTP-PCN-ENV-21-004 (8C.2022.Q2) |
| 06/24/2020 | 8C.2020.3F |

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## 3C.1 INTRODUCTION

This Waste Analysis Plan (WAP) for the Direct-Feed Low Activity Waste (DFLAW) configuration describes the sampling and analysis for dangerous waste constituents for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) to comply with the Washington State Dangerous Waste Regulations contained in the Washington Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*. Records specific to WTP will be managed in the WTP Unit Specific Operating Record that is kept as a part of the Hanford Facility Operating Record WAC-173-303-300(2)(b).

The WAP also ensures the waste analysis is comprehensive and reflects the outcome of the *Integrated DFLAW Feed Qualification Data Quality Objectives* (DFLAW DQO Report), 24590-LAW-RPT-PENG-16-003, and sample analysis performed on the tank waste feed stream to be treated by WTP. Sampling and analysis criteria identified in the DFLAW DQO Report related to meeting Resource Conservation and Recovery Act (RCRA) requirements are included as an integral part of this WAP.

Regulatory and saftey issues are addressed in this WAP and establish bounding conditions for waste to be received and treated at the WTP. These boundary conditions establish limits for waste acceptance.

## 3C.2 SCOPE

This WAP describes the general requirements for the sample collection and regulatory analysis of waste to be processed by the WTP, and the requirements for characterization of secondary wastes where process knowledge is inadequate to support designation.

The Tank Operations Contractor will characterize the staged Double-Shell Tank (DST) waste feed in conformance with the DFLAW DQO Report. Based on the results, the Tank Operations Contractor will develop a waste profile specific to the waste and the planned treatment campaign.

Prior to transferring waste, the WTP will evaluate the waste profile and characterization data for conformance with WTP waste acceptance criteria. The WTP will use this information to ensure the waste feed planned for receipt meets waste acceptance criteria. Analytical results will also be used to determine the appropriate treatment requirements for each campaign. The volume of the waste transferred from the Tank Operations Contractor will be compared with the volume received at WTP to confirm the waste transfer was completed as planned.

Simplified process flow figures for WTP processes are included in Appendix 4A of the Dangerous Waste Permit (DWP). The waste will be combined with glass-forming chemicals and melted into a solid glass form in a process known as vitrification.

Operation of WTP will generate secondary wastes, in solid and liquid form. These wastes will be designated according to available process knowledge or will be sampled and analyzed as necessary to fully address Treatment, Storage, or Disposal (TSD) unit waste acceptance criteria and to comply with regulatory requirements (e.g., identification of land disposal restriction treatment requirements). Secondary wastes generated at WTP will be transported to the Integrated Disposal Facility (IDF), Hanford TSD Operating Unit Group 11, subject to that TSD unit's waste acceptance criteria or to an off-site licensed and permitted commercial TSD for proper treatment and/or disposal.

## 3C.3 FACILITY DESCRIPTION

In the DFLAW configuration, treated Low-Activity Waste (LAW) from the Hanford Tank Farms is transferred to the LAW Vitrification Facility via an underground waste transfer line. The DFLAW configuration consists of the LAW, Analytical Laboratory (Lab), and the Effluent Management Facility (EMF), and underground waste transfer lines that allow for the transfer of waste to and from the LAW Vitrification Facility. The DFLAW configuration is independent of the Baseline configuration and is only used prior to Pretreatment (PT) Facility startup and could also be used in the event of a prolonged PT Facility outage.

DFLAW Plant equipment will include the following:

- Pipelines, tanks, and ancillary equipment.
- Evaporation units.
- Chemical addition equipment (including glass-forming chemicals).
- LAW melters.
- Service and utility units.
- Container management units.
- Storage facilities.
- Offgas treatment systems.

## 3C.4 GENERAL CONSTITUENT DESCRIPTION

WTP is specifically designed to accept waste from the DST System. The mixed waste to be treated in the DFLAW configuration is an aqueous solution containing dissolved inorganic salts such as sodium, potassium, aluminum, hydroxides, nitrates, and nitrites with some tanks having detectable levels of heavy metals such as lead, chromium, cadmium, mercury. Small quantities of ammonia and organics, such as acetone, butanol, and tri-butyl phosphate, could be present. The physical consistency of the waste in the DST System ranges from aqueous supernate to thick sludge. The only waste feed to the DFLAW configuration is aqueous supernate; tank waste sludge is not processed through the DFLAW configuration.

**Table 3C-1 Summary of Dangerous Waste Codes for Waste Treatment Plant**

| Characteristic Waste Codes | | | | Listed Waste Codes | | |
|---|---|---|---|---|---|---|
| D002 | D004 | D005 | D006 | F001 | F002 | F003 |
| D007 | D008 | D009 | D010 | F004 | F005 | |
| D011 | D018 | D019 | D022 | | | |
| D028 | D029 | D030 | D033 | | | |
| D034 | D035 | D036 | D038 | | | |
| D039 | D040 | D041 | D043 | | | |
| WT01[a] | WT02[a] | WP01[a] | WP02[a] | | | |

[a]Washington State criteria.

## 3C.5 WASTE PRE-ACCEPTANCE AND ACCEPTANCE PROCESSES

This section describes the actions performed before every campaign to determine candidate feed tank waste is acceptable for treatment at WTP.

Step 1: The Tank Operations Contractor submits a waste profile. The content and format of the profile will be established prior to the transfer of waste feed. The following are examples of the information that will be provided in the profile:

- General information (e.g., the identification of the source DST tank from which the transfer will be made and the date of the proposed transfer).
- Physical properties of the waste feed (e.g., the proposed volume of each batch transfer and the presence or absence of a separate visible organic layer).

- Relevant process knowledge and historical analytical data (e.g., Total Organic Carbon [TOC]).
- Dangerous waste information (e.g., the designation of dangerous waste codes) and Land Disposal Restrictions (LDR) information.

Step 2: WTP personnel perform a preshipment review by examining the waste profile and the analytical results to ensure compatibility and acceptability of the staged waste feed. If the review finds that the waste feed is acceptable, the WTP notifies the Tank Operations Contractor that the waste feed can be transferred. If the review finds that the waste feed is not acceptable, non-conformance actions are initiated.

Step 3: Non-conformance actions include a second review of the data and information and may include a second analysis of the split sample aliquot. If the waste feed continues to be outside of the waste acceptance criteria, adjustments may be used to change the waste composition such that acceptance criteria are met. Alternately, a change to the waste acceptance criteria may be made on a case-by-case basis (as long as there are no design or safety basis impacts and permit compliance is maintained). Otherwise, the waste will be refused for transfer (transferred to an alternative treatment or stored until other alternatives are identified).

Step 4: Once the transfer systems are confirmed as operational, the Tank Operations Contractor will transfer the waste feed to the LAW Concentrate Receipt Vessel (CRV) through a double-walled pipeline. The pipeline will be flushed after the transfer is complete, as appropriate.

Step 5: After waste feed is received into WTP, the Tank Operations Contractor and the WTP performs volume transfer and receipt comparison measurements to ensure that the volume of waste feed transferred is the volume of waste feed that was received.

The WTP feed acceptance criteria described in this section are consistent with those provided in the DFLAW DQO Report. The DFLAW DQO Report describes the constituents of regulatory concern and is designed to address the regulatory needs of the WTP in the DFLAW configuration. The waste acceptance parameters are as follows:

**Table 3C-2 Method and Sample Size for Selected Constituents**

| Parameter | Analytical Method[a] | Sample Size (mL)[b] |
|---|---|---|
| TOC | 9060A | 3 |
| Polychlorinated biphenyls (PCBs) | 8082A | 2 |
| pH | pH meter, 9040C | 5 |
| Compatibility | ASTM D5058-90 | 20 |
| RCRA metals | 6010D | 3 |
| Mercury (Hg) | 7470A or 7471B | 1 |
| Selected anions | 9056A | 20 |
| Ammonia/ammonium | SM 4500-$NH_3$-F or Environmental Protection Agency (EPA) Method 350.3 or Method 350.1 | 0.5 |

[a]Methods are from EPA SW-846, as amended, unless otherwise indicated. The specified method revision or newer will be used.

[b]Sample sizes are subject to change as long as this substitution does not affect the overall quality of the analyses.

### Estimated Sample Size

Collection of samples is performed to maximize contamination control and to minimize sampler exposure. It is anticipated that 170 mL of supernatant liquid per LAW sample shall be sufficient. Per the sampling event requirements described in the DFLAW DQO Report, the specific sample volume and number of samples to be collected are to be specified in the Tank Sampling and Analysis Plan (TSAP) for the corresponding staged feed. Typically, the laboratory will specify the sample size (volume) and will provide the required sample bottle(s).

### Total Organic Carbon

The waste feed will be analyzed to determine the TOC as described in the DFLAW DQO Report. The TOC has been chosen for analysis of the waste feed to ensure that the WTP is not required to comply with Subpart BB of WAC 173-303-691. The analytical method is SW-846, *Test Methods for Evaluating Solid Waste, Physical Chemical Compendium*, Method 9060A, using persulfate oxidation. The sample aliquot volume requirements for this analysis are expected to be 3 mL. This method typically measures TOC to levels of about 1 parts per million (ppm). The criteria for waste acceptance is 10 wt% TOC, or less. Method 9060A will meet the 1 percent detection limit, as given in Table 3C-6. The solids will be analyzed separately for TOC.

### Polychlorinated Biphenyls

The Hanford tank waste supernate contains PCBs at concentrations below 50 ppm. These are regulated under the *Toxic Substances Control Act of 1976* (15 United States Code [USC] 2601 et seq.), and codified in 40 Code of Federal Regulations (CFR) 761.61, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions – *PCB remediation waste*, as PCB remediation waste – agreed upon in the *Framework Agreement for Management of Polychlorinated Biphenyls (PCBs) in Hanford Tank Waste* (Department of Ecology [Ecology], EPA, and Department of Energy [DOE] 2000). Modification of the basic extraction procedure given in this method is expected to be needed to decrease the sample size and allow the extraction to be performed in a shielded glovebox. It is anticipated that a sample size of 2 mL would be required for liquids. If any single liquid sample contains more than 5 percent solids after centrifuging, the liquid and solid will be analyzed separately. The waste feed sample aliquots will be analyzed to ensure that the waste feed contains less than 50 ppm PCBs. The sample will be separated into solid and liquid phases and analyzed for PCBs by SW-846 Method 8082A.

### pH

The measurement of pH will ensure that the waste feed is compatible with the WTP materials of construction and treatment processes. Method 9040C of SW-846 will be used to measure pH. The estimated sample size is 5 mL. The decision criteria is greater than pH 12, as presented in Table 3C-6. With a pH above 12, the effect of chloride on uniform corrosion, pitting, or cracking is negligible.

### Compatibility

The waste feed will be evaluated for compatibility with the residual aqueous waste in the LAW CRV before being accepted into the WTP. These evaluations will focus on the potential for a waste stream to react in an uncontrolled fashion with another waste (40 CFR 264, Appendix V, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – *Examples of Potentially Incompatible Wastes*). Although problems associated with co-mingling aqueous waste feeds are not expected, this evaluation will ensure the compatibility of two or more aqueous waste feeds from different DST System unit tanks.

Waste feed compatibility will be evaluated using ASTM D5058-90, *Standard Test Methods for Compatibility of Screening Analysis of Waste*. Consistent with As Low As Reasonably Achievable practices, a reduced sample volume will be applied to the proposed DST System unit waste feed and the WTP feed receipt tank residual waste. This method prescribes the mixing of aliquots of the two waste streams and an evaluation of any temperature change of the mixture. The method also calls for a visual examination to determine whether viscosity has increased. These evaluations will be performed to test for potential incompatibilities that could adversely affect the management of the waste in the WTP. The waste acceptance criteria for compatibility is a temperature change less than ± 20°C.

The recommended sample volume for this test method is 150 to 300 mL. The sample size will be decreased to 10 mL from each waste feed, for a total of 20 mL of the combined waste feeds for waste minimization and will comply with the As Low As Reasonably Achievable philosophy, referred to as "ALARA."

### Resource Conservation and Recovery Act Metals

The waste feed will be evaluated for toxicity characteristic metals, underlying hazardous constituent metals and metals of interest for delisting of Immobilized High-Level Waste (IHLW) (delisting of IHLW is the basis for the Immobilized Low-Activity Waste [ILAW] treatability variance). Waste feed metals will be determined using Methods 7470A or 7471B of SW-846 for mercury and Method 6010D of SW-846 for metals other than mercury. The waste feed metals are the following:

- Antimony.
- Arsenic.
- Barium.
- Beryllium.
- Cadmium.
- Chromium.
- Lead.
- Mercury.
- Nickel.
- Selenium.
- Silver.
- Thallium.

The recommended sample size for metals (except mercury) is 3 mL and the recommended sample volume for mercury is 1 mL.

### Anions

Waste feed will be evaluated for the following anions using Method 9056A of SW-846:

- Fluoride.
- Chloride.
- Sulfate.

The recommended sample size for anions analysis is 20 mL.

Ammonia

Waste feed will be evaluated for ammonia using EPA Method 350.1 or Method 350.3 or Standard Method 4500-$NH_3$-F. It is anticipated that 0.5 mL of liquid will be necessary for the analysis. For these methods, the latest update version will be utilized for testing.

Table 3C-6 provides a summary of the waste analysis parameters, analytical methods, acceptance criteria and a description of action to undertake should a nonconformance occur.

### 3C.5.1 Generated Wastes

In addition to the vitrified glass product generated at the LAW Facility, the processes at the Lab, EMF, and LAW facilities will generate a variety of solid, liquid, and gaseous waste streams. Some of these waste streams include waste derived from the incoming feed from the DST System unit. Other wastes include spent materials used in processing the waste feed, such as scrubber solutions that come into contact with the waste feed or its derivatives, and contaminated equipment. General facility operations and maintenance activities will also generate dangerous waste.

This section describes the secondary waste streams generated by the WTP, including characterization of secondary waste, the associated sampling and analysis activities, and the ultimate treatment, storage and disposal of regulated waste. Sampling for secondary waste streams will be outlined in waste management procedures. Air emissions standards, commonly referred to as Subparts AA, BB, and CC, are discussed in Section 3C.6. Other regulated air emissions are addressed under the *Clean Air Act of 1990* (42 USC 7401 et seq.) and the *Washington State Clean Air Act of 1967* (Revised Code of Washington [RCW] 70.94 et seq.) permits and are not included in the following discussions.

Secondary waste streams are divided into solid waste streams (discussed in Section 3C.5.2, Secondary Solid Waste Streams) and liquid waste streams (discussed in Section 3C.5.3, Liquid Waste Streams). Dangerous waste streams generated within the WTP will meet the waste acceptance criteria or protocols established by the receiving TSD facilities' permits and operating authority. This document does not outline the details of sampling and analyzing each waste stream because each TSD receiving waste may update its waste acceptance criteria and thus alter the required waste analyses.

Secondary liquid waste streams that will be transferred back to the DST System unit will be designated with waste codes based upon process knowledge or by characterization where process knowledge is inadequate. Waste transferred to the DST System unit will meet the DST waste acceptance criteria.

The following general information related to waste classification applies to solid and liquid secondary waste streams:

- Waste streams can be designated using process knowledge. Acceptable process knowledge includes:
  - Historical analytical data.
  - Mass balance from a controlled process with a specified output for a specified input (for example, by tracking waste transfer, heel, and flush water volumes, the composition of a given stream can be estimated from the feed characterization data).
  - Safety Data Sheets (SDS).
  - Analytical data on the waste from a similar process.
  - For mixed waste, process knowledge could include information from surrogate material (that is, a non-radioactive waste generated from an analogous activity or process).
- The listed waste codes F001 through F005 will follow the secondary waste if the secondary waste is derived from the waste feed.

- Secondary wastes not derived from the waste feed (e.g., Lab and maintenance waste) will be characterized and designated with the appropriate EPA hazardous waste codes and Washington State dangerous waste codes, and managed accordingly.
- If analyses are required for determining waste codes for a secondary waste, laboratory procedures will be prepared using applicable SW-846 methods. Analytical procedures will be revised, as appropriate, if SW-846 methods are revised.
- Documentation of the process knowledge or analytical data used to designate the waste codes will be maintained in the WTP operating record.
- Compatibility is assessed and documented consistent with waste management procedures and profile(s) as determined by analysis and/or process knowledge.
- Compatibility reviews will be performed on waste managed in containers, including the selection of compatible packaging materials (containers and absorbents) and to prevent incompatibility reactions when mixing different waste materials in the same container.

### 3C.5.2 Secondary Solid Waste Streams

Solid waste will be generated from WTP operations and includes a wide variety of wastes – such as waste derived from routine maintenance activities, nonroutine maintenance activities, and daily operating activities. The following sections describe the various mixed and variable solid waste types to be generated. Refer to the WAP glossary for additional details on the specific waste types.

Solid waste streams that will come into contact with the waste feed during any stage of the treatment processes may be designated as mixed waste by process knowledge or by characterization where process knowledge is inadequate. EPA hazardous waste codes and Washington State dangerous waste codes will be assigned to these mixed waste streams, based on the characterization of the waste feed. Each waste stream discussed below will meet the waste acceptance criteria of the receiving facility. A discussion of each of these mixed waste streams is provided.

**Table 3C-3 Secondary Solid Mixed Waste Streams**

| Waste Stream | Characterization | Disposal |
|---|---|---|
| Out-of-service melters | Designated by process knowledge or by characterization where process knowledge is inadequate. | These wastes will be packaged and transferred for treatment, as necessary and then shipped to the IDF, Hanford TSD Operating Unit Group 11, for disposal. |
| Melter components | | |
| Ancillary equipment | | |
| Catalyst from offgas treatment | | |
| Offgas treatment system components:<br>• High-efficiency mist eliminators. | | |
| Offgas treatment system components:<br>• High-efficiency particulate air (HEPA) filters.[1] | Designated by process knowledge or by characterization where process knowledge is inadequate. | Shipped to an off-site licensed and permitted commercial TSD Facility for treatment and then returned to IDF for disposal.<br>Or<br>Shipped to an off-site licensed and permitted commercial TSD Facility for treatment and disposal. |

**Table 3C-3 Secondary Solid Mixed Waste Streams**

| Waste Stream | Characterization | Disposal |
|---|---|---|
| LAW Carbon bed adsorbers (spent carbon)[1] | Designated by process[2] knowledge or by characterization where process knowledge is inadequate. | Shipped to an off-site licensed and permitted commercial TSD Facility for treatment and then returned to IDF for disposal.<br>Or<br>Shipped to an off-site licensed and permitted commercial TSD Facility for treatment and disposal. |

[1]As detailed in the *Tank Closure and Waste Management Environmental Impact Statement Amended Record of Decision for Offsite Secondary Waste Treatment and Disposal from the Hanford Site*, Washington, dated January 25, 2023.

[2]Sample results will determine the disposal location and the necessity of an LDR treatability variance.

### Out-of-Service Melters

It is anticipated that melters will require replacement at some point, due to the conditions of the vitrification process. Residual molten glass is vitrified. The melter will be allowed to cool and then will be disconnected.

Treatment of the used melters is not required because the vitrified glass remaining in the melters meets the criteria associated with the LDR treatment variance approved by Ecology (19-NWP-165).

### Melter Components

Melters will be fitted with various components (e.g., bubbler assemblies and thermocouples) that will require periodic replacement. The melter components will be removed, designated by process knowledge as mixed waste, and packaged and transferred to the IDF, Hanford TSD Operating Unit Group 11.

Some melter components will have vitrified glass remaining on or within the component, therefore the LDR treatment variance, approved by Ecology (19-NWP-165), will also apply to this secondary waste stream. Melter components that do not have vitrified glass remaining on or within them will be treated at an off-site licensed and permitted commercial TSD to meet LDR and disposed of at IDF.

### Ancillary Equipment

Ancillary equipment (e.g., pumps, valves, piping, motors, and electrical equipment) no longer fit for use, will be removed from service and designated as waste. Equipment that has been in contact with the waste feed will be packaged for transportation and may be treated for disposal at an off-site licensed and permitted commercial TSD to meet the LDR, prior to disposal at IDF.

### Offgas Treatment System Components

HEPA filters and High Efficiency Mist Eliminators will be components of the offgas treatment system incorporated to remove contaminants from the offgas streams prior to discharge. These components will periodically be replaced to maintain treatment efficiency. They will be packaged for transportation and may be shipped to an off-site licensed and permitted commercial TSD for treatment and disposal or shipped to an off-site licensed and permitted commercial TSD for treatment and then returned to IDF for disposal once the waste meets the LDR.

Spent Carbon and Catalyst from Offgas Treatment

Spent carbon and catalyst from offgas treatment will periodically be replaced to maintain treatment efficiency. These materials will be designated by process knowledge or characterization where process knowledge is inadequate and managed as mixed waste. They will be removed from their respective equipment, packaged, and treated at an off-site licensed and permitted commercial TSD to meet the LDR prior to disposal at IDF, Hanford TSD Operating Unit Group 11. Carbon Bed Adsorbers (spent carbon) may also be treated and disposed of at an off-site licensed and permitted commercial TSD.

### 3C.5.3 Variable Solid Waste Streams

The waste streams listed in Table 3C-4 can be radioactive waste, dangerous waste, or mixed waste, depending on the source of the waste and whether it had contact with the waste feed. The EPA hazardous waste codes and Washington State dangerous waste codes will be assigned to these waste streams, based on the designation of the waste by process knowledge or by characterization where process knowledge is inadequate. In addition to the waste streams listed in Table 3C-4, raw process materials and chemicals will be brought onto the WTP site. Some of these substances may subsequently become waste and will require characterization for proper waste management. The SDS provides the information necessary to properly characterize and designate a substance when it becomes a waste. Vendors will be required to provide SDS for substances that will be brought onto the WTP site, and an SDS file will be maintained by the WTP. Examples of these types of substances are process and laboratory chemicals, lubricants (e.g., oils and greases), and maintenance products (e.g., paints, solvents, and adhesives).

**Table 3C-4 Variable Solid Waste Streams**

| Waste Stream | Characterization | Disposal |
|---|---|---|
| Non-wastewater laboratory waste | Each generation event of these wastes will be individually designated by process knowledge or by characterization where process knowledge is inadequate and will comply with the receiving TSD waste acceptance criteria. | The wastes will be packaged and transferred for disposal to the IDF, Hanford TSD Operating Unit Group 11. |
| Personal Protective Equipment (PPE) | | |
| Maintenance waste | | |

Subcontractors to the WTP will be required to have an SDS for the substances that they bring onto the WTP site.

Laboratory Waste

Non-wastewater laboratory waste derived from the waste feed will be designated as mixed waste by process knowledge or by characterization where process knowledge is inadequate, packaged, and transferred to the IDF, Hanford TSD Operating Unit Group 11. Other non-wastewater laboratory wastes (e.g., off-specification laboratory chemicals and spent or unused simulant) will be designated by process knowledge or by characterization where process knowledge is inadequate and managed accordingly. These wastes will be packaged for transportation and may be treated for disposal at an off-site licensed and permitted commercial TSD to meet the LDR.

## Personal Protective Equipment

Personnel performing certain tasks such as facility maintenance, treatment process operations, and waste packaging activities, may wear PPE. Used PPE may be returned to the vendor for cleaning and refurbishment. Used PPE that cannot be recycled to the vendor and has had contact with waste feed or other sources of radiological contamination will be designated as radioactive or mixed waste by process knowledge or by characterization where process knowledge is inadequate, packaged, and transferred to the IDF, Hanford TSD Operating Unit Group 11, for disposal. The nonradioactive waste PPE designated as dangerous waste by process knowledge or by characterization where process knowledge is inadequate, will be packaged for transportation and may be treated to meet LDR and disposed at an off-site licensed and permitted commercial TSD facility.

## Maintenance Waste

Maintenance wastes (e.g., paints, lubricants, cleaning solvents, adhesives, and off-specification chemicals) will be generated at the WTP. Maintenance waste that comes in direct contact with tank farms waste feed will be designated as mixed waste. Waste contaminated by indirect contact will be designated based on process knowledge as radioactive waste or mixed waste as appropriate and transferred to the IDF, Hanford TSD Operating Unit Group 11, for treatment (if necessary) and disposal. Those not derived from the waste feed and designated as dangerous waste by process knowledge or by characterization, where process knowledge is inadequate, will be packaged for transportation and may be treated to meet LDR and disposed at an off-site licensed and permitted commercial TSD facility.

## Liquid Waste Streams

The dangerous and mixed liquid waste streams generated at the WTP that cannot be incorporated back into the treatment process (recycled) will be managed in accordance with the Liquid Effluent Retention Facility/Effluent Treatment Facility (LERF/ETF) waste acceptance criteria. The liquid waste streams that can be sent to LERF/ETF are listed in Table 3C-5 with the exception of EMF evaporator concentrate (bottoms). The LERF/ETF will receive hazardous aqueous waste generated at WTP. The waste will meet the acceptance criteria as outlined in the LERF/ETF waste acceptance criteria. The LERF/ETF allow process knowledge to be used in lieu of some analyses in instances where process knowledge is adequate, and a LERF/ETF representative will work with a WTP representative to identify the waste acceptance criteria and analyses appropriate for liquid waste characterization.

Aqueous waste streams listed in Table 3C-5 will be collected. Should sampling be required, the sample will be drawn from a location identified in Figure 4A-1 of Chapter 4A as S2. Samples will be taken from the effluent collection tank, in accordance with a sampling procedure which is included in the WTP Unit Specific Operating Record.

**Table 3C-5 Liquid Mixed Waste Streams**

| Waste Stream | Characterization and Disposal | Sampling Point | Sampling Frequency |
|---|---|---|---|
| EMF evaporator concentrate (bottoms)[1] | Transported to an offsite[2] TSD Facility for treatment and disposal | TBD[2] | TBD[2] |
| LAW offgas condensate | The waste streams, not subject to recycling, will collect in a mixer tank, be designated as mixed waste by process knowledge and analysis, as necessary, and will be transferred to the LERF/ETF (or tanker truck, as a contingency), or DST System unit. | The streams collected in a mixed tank are manually sampled. | Sampling will be performed under the following circumstances:<br>• Before initial discharge.<br>• Updated waste profile determined.<br>• At request for resampling by the receiving facility. |
| LAW LVP scrubber blowdown | | | |
| Laboratory wastewater | | | |
| Plant wastewater containing waste feed | | | |
| EMF evaporator condensate | | The streams collected in a tank are grab sampled manually or sampled in-line (confirmatory sample during transfers). | |

[1]As detailed in the *Tank Closure and Waste Management Environmental Impact Statement Amended Record of Decision for Offsite Secondary Waste Treatment and Disposal from the Hanford Site*, Washington, dated January 25, 2023, the treated EMF evaporator concentrate sent off-site is limited to approximately 2,660, 55-gallon drums per year, or 26,600 drums (approximately 5,640 cubic meters), in the grouted waste form, over the expected ten years of operation for the DFLAW configuration.

[2]Sampling point and frequency columns will need to be populated when this information is available. The details of removal and transportation of the EMF evaporator concentrate (bottoms) will be discussed in Chapter 4G in a future permit modification, as required by Condition III.10.M.3.d.

When the WTP is configured for the DFLAW configuration, samples of condensate and liquid effluent may be taken from the appropriate EMF vessel or the effluent transfer pipeline after additions for corrosion control, and analyzed to verify the liquid waste stream meets the LERF/ETF waste acceptance criteria. Additional sampling and analysis of EMF evaporator condensate may be performed for compliance purposes, or as agreed to by WTP and LERF/ETF.

A discussion of each aqueous waste stream is presented below.

## Aqueous Waste from Processes

Table 3C-5 lists the aqueous waste streams that will be generated by the WTP from processing the DST waste feed, which include EMF evaporator condensate, LAW offgas condensate, LAW LVP scrubber blowdown, Laboratory wastewater, plant wastewater, and EMF evaporator concentrate (bottoms). The Lab will also generate aqueous waste. These waste streams will contain both radioactive and dangerous waste components.

## Plant Wastewater

Wastewater will be generated primarily from decontamination and wash-down activities in the WTP. The wastewater will be designated as mixed waste by process knowledge or by characterization where process knowledge is inadequate, since it may contain dilute waste feed constituents.

Effluent Management Facility Evaporator Condensate and Concentrate (Bottoms)

Evaporator condensate from the EMF is transferred to the LERF/ETF by underground pipeline for treatment.

EMF evaporator concentrate (bottoms) is the concentrated aqueous waste (the remaining waste after excess water is evaporated) generated primarily by the LAW vitrification facility offgas treatment processes. EMF evaporator concentrate (bottoms) is typically recycled back to the LAW Facility or a facility operated by the Tank Farms Contractor for eventual incorporation into ILAW, but can be returned to the DST System unit for storage in the unlikely event that the waste cannot be recycled. It has been discussed that during operations there may be a halide build up in the EMF evaporator concentrate (bottoms). If this halide build up occurs or if there is some other operational constraint, an alternate contingency for a portion of the evaporator concentrate (bottoms) is to transfer them by tanker truck to an off-site licensed and permitted commercial TSD for treatment and disposal. The EMF evaporator concentrate (bottoms) will be designated as mixed waste if transported to an off-site TSD Facility for treatment and disposal.

### 3C.5.4 Land Disposal Restrictions Evaluation for Immobilized Waste

This section describes the approach for addressing the LDR program requirements applicable to the land disposal of ILAW.

The LDRs are codified in WAC 173-303-140, Dangerous Waste Regulations – *Land disposal restrictions*, which incorporates 40 CFR 268, *Land Disposal Restrictions*, by reference. In 40 CFR 268.40, Land Disposal Restrictions – *Applicability of treatment standards*, the treatment standards for land disposal of a dangerous waste are identified as follows:

> (a) A prohibited waste identified in the table "Treatment Standards for Hazardous Wastes" may be land disposed only if it meets the requirements found in the table. For each waste, the table identifies one of three types of treatment standard requirements:
>
> (1) All hazardous constituents in the waste or in the treatment residue must be at or below the values found in the table for that waste ("total waste standards"); or
>
> (2) The hazardous constituents in the extract of the waste or in the extract of the treatment residue must be at or below the values found in the table ("waste extract standards"); or
>
> (3) The waste must be treated using the technology specified in the table ("technology standard"), which are described in detail in §268.42, Table 1 – Technology Codes and Description of Technology-Based Standards.

The total waste standards and waste extract standards require repeated sampling and analysis of the waste to demonstrate that the dangerous constituents in the waste are at or below the values found in the table. These standards are appropriate for a limited dangerous waste stream, but are not a good choice for a mixed waste stream of extended duration because of repeated human exposure during sampling and analysis. Because of this, a technology-based standard is preferable for vitrified waste.

The Permittees will initially sample 10 percent of the secondary waste streams coming from the LAW operations, during processing of tank waste, to compare against the process knowledge information from the flowsheet. If the sampling results for the secondary waste are consistent with the flowsheet then process knowledge will be used. If the sample results do not match, then sampling frequencies will increase until the process knowledge information for secondary waste stream characterization is accepted by IDF. If there is a significant change in either the waste feed, then the Permittees will use 10 percent sampling to re-establish the process knowledge for the secondary waste associated with treating the waste.

Table 1 in 40 CFR 268.42, Land Disposal Restrictions – *Treatment standards expressed as specified technologies*, includes the technology-based standard "HLVIT" (high-level waste vitrification). At the request of DOE, the HLVIT treatment technology was promulgated by the EPA to treat the tank waste at the Savannah River Site (refer to *Land Disposal Restrictions for Third Third Scheduled Wastes*). According to the table in 40 CFR 268.40 regarding treatment standards for hazardous wastes, HLVIT is the technology for the treatment of the following dangerous waste codes from radioactive high-level wastes generated during the reprocessing of fuel rods:

- D002 Corrosivity (pH).
- D004 Arsenic.
- D005 Barium.
- D006 Cadmium.
- D007 Chromium (total).
- D008 Lead.
- D009 Mercury.
- D010 Selenium.
- D011 Silver.

Similar to the treatment of the Savannah River Site tank waste, the treatment of the Hanford tank waste will require many years of WTP operation. Rather than repeated sampling and analysis of the waste to demonstrate LDR using the total waste standard or the waste extract standard, it would be appropriate to treat the Hanford tank waste to a specific treatment standard (e.g., the HLVIT technology-based standard described above for the Savannah River Site tank waste). WTP submitted a petition for a site-specific variance as directed under 40 CFR 268.44(h) that would specify HLVIT as the method of treatment for Hanford tank waste processed through the WTP for all applicable waste codes and Ecology approved that petition (19-NWP-165).

During WTP Cold Commissioning, the Permittees will collect glass samples from ten (10) cold commissioning ILAW containers to perform chemical composition, Product Consistency Test (PCT), and Vapor Hydration Test (VHT) analyses for each. During Cold Commissioning, sample collection will first be attempted from shards; if not enough shards are available, sufficient ILAW samples will be obtained by another method. During tank waste operations, when waste is radioactive, for each DST batch (as defined in Section III.10.A), if ILAW glass shards are available in sufficient quantity for testing, the glass will be tested, in order of priority relative to the availability of shards, for chemical analysis and PCT. Sampling and analysis will be performed twice per DST batch for the first two DST batches and then once per DST batch thereafter. The mass of recoverable shards from a single representative sampling event during tank waste operations are not expected to support the analytical method prerequisites for performance of VHT testing without additional sample manipulation (e.g., re-melting shards to form the required monolith size), which can affect the glass composition and durability and may not reflect ILAW produced by the facility.

Resulting data from all testing will be compared to the expected values for the glass compositions planned for the relevant Cold Commissioning or DST feed. The testing data and resulting comparisons will be compiled in an annual report to be provided to Ecology and maintained in the operational record. If the availability and quantity of recoverable ILAW glass shards cannot support any or all the testing and analyses identified in this section during Cold Commissioning and the first DST batch, the Permittees will provide to Ecology a summary report of ILAW product verification activities which were performed and propose an alternative approach to additional ILAW glass sampling, if needed. After processing five (5) DST batches of tank waste, the Permittees may request to revise or discontinue shard sampling and testing should the results of completed analyses provide technically acceptable results.

### 3C.5.5 Waste Feed Rejection Policy

Confirmatory action (e.g., re-analysis and data review) will be performed for each waste feed analytical result that does not initially meet the acceptance criteria presented in Table 3C-6. Re-analysis of a sample that fails an acceptance criterion will consist of two repeat analyses for the failed criteria. If both of the repeat analyses pass, then the sample will be considered to meet that acceptance criteria. If one or both of the repeat analyses fail, the waste will be considered nonconforming. If the waste feed is determined to be nonconforming, then the WTP, the Tank Operations Contractor, or both, will determine and execute corrective actions necessary to be able to transfer and process the waste feed. Such actions may include:

- Waste feed adjustment to meet the WAC requirements.
- Change acceptance criteria requirements if there is no impact to the WTP design, safety basis, or permit requirements (on a case-by-case basis).

If no feasible alternative is found and the feed cannot be accepted, the following actions will be implemented:

- Return to Tank Operations Contractor.
- Continued waste storage until an alternative is identified.

The nonconformance decisions, corrective actions, supporting data, and the names and titles of the individuals making these decisions will be documented and retained as a quality assurance (QA) record, according to procedures described in Chapter 3B, "Quality Assurance Project Plan for the Waste Analysis Plan" (herein referred to as the QAPjP).

### 3C.5.6 Discrepancy Policy

If discrepancies, such as improper container labeling, improper packaging, nonconformance issues, or manifest inconsistencies, are discovered during the container receipt inspection, discrepant containers will not be processed for shipment until the discrepancies have been resolved using one or more of the following alternatives:

- Incorrect or incomplete entries on the Uniform Hazardous Waste Manifest or on-site shipping paperwork can be corrected with concurrence from the generator. Corrections are made by drawing a single line through the incorrect manifest entry. Corrected entries are initialed and dated by the individual making the correction.
- The waste package(s) can be held and segregated from other stored waste.
- The waste package may be returned to the generator for a detailed chemical, physical, and/or biological analysis of waste.

If the waste container is damaged to such an extent, or the waste is in such a condition as to present a hazard to the public health or the environment in the process of further transportation, then a generator may be contacted to provide additional information or requested to provide corrective actions, or actions may be taken in accordance with Chapter 7, "Building Emergency Plan."

### 3C.5.7 Sampling Strategies and Frequency

The samples collected for characterization of the waste feed, by the Tank Operations Contractor, for transfer to the WTP will be collected as described in the DFLAW DQO Report. Six samples will be collected from the waste feed tank for characterization of the waste stored in that tank prior to transferring the waste to WTP.

Samples will be accompanied by a chain-of-custody at all times, ensuring accountability of the sample and associated records. At a minimum, the following information must be identified on a completed chain-of-custody 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 sample locations, dates of receipt and relinquishment).
- Additional information regarding the sample and specific analytical instructions may also be identified.

Sample preservation, storage, and holding times for the samples collected to support characterization of the DST waste feed are discussed in the DFLAW DQO Report.

Disposable sampling equipment will eliminate the need for equipment decontamination after use, and is the preferred sampling option. If the use of disposable equipment is not practical, the sampling equipment will be decontaminated before and following each sample event.

### 3C.5.8 Analytical Parameters and Test Methods

The analytical methods that will be used to obtain the necessary data for characterizing the DST waste feed are addressed in the DFLAW DQO Report.

The WTP will contract with other laboratories to provide analytical services, as necessary, based on a review of the ability of each laboratory to provide acceptable data for the types of waste handled by the WTP. The review may include an on-site surveillance of the laboratory facilities, and a review of its documentation. Evaluation of candidate laboratories may be based on the following criteria:

- Licenses or permits issued by the applicable government authority, allowing the laboratory to handle waste samples that contain chemical and radiological components.
- Laboratory accreditation in State of Washington.
- Analytical capacity, including number and type of analytical instruments, sample preparation facilities, and sufficient uncommitted capacity, or a commitment to procure sufficient capacity to handle the sample load.
- Adequate number of qualified technical staff.
- Demonstrated history of performing acceptable analyses.
- Adequate sample tracking system.
- A demonstrated QA program and participation in performance evaluation.

### 3C.5.9 Quality Assurance/Quality Control and Data Reporting

Data quality for waste feed characterization are addressed in the DFLAW DQO Report. Additional QA and Quality Control (QC) requirements for sampling and analysis in support of the characterization of the waste feed and the characterization of secondary waste streams are provided in Chapter 3B, “Quality Assurance Project Plan” of this permit.

## 3C.6 AIR EMISSIONS

Emissions from the stacks that vent the WTP processes will be monitored according to the provisions of the *Hanford Air Operating Permit*, as required by WAC 173-303-395(2), Dangerous Waste Regulations – *Other general requirements*. Monitoring and sampling to address air emissions concerns under these permits will not be addressed in this application. However, the applicability of the air emissions requirements found in WAC 173-303 will be evaluated in the following sections. Details of the air emissions control systems for the WTP are provided in Chapter 4, "Process Information," of the DWP.

- *Air Emission Standards for Process Vents* (Subpart AA)

  WAC 173-303-690, Dangerous Waste Regulations – *Air emission standards for process vents*, commonly referred to as "Subpart AA," regulates process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air- or steam-stripping operations that manage hazardous wastes with organic concentrations of at least 10 ppm by weight. WAC 173-303-690 incorporates the provisions of 40 CFR 264, Subpart AA, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – *Air Emission Standards for Process Vents*, by reference. The WTP does not employ any of these listed devices or processes; therefore, the WTP is not subject to regulation under Subpart AA. Refer to 24590-WTP-RPT-ENV-01-001, Rev 0, *RCRA Subpart AA Applicability*, for the regulatory analysis that resulted in this conclusion.

- *Air Emission Standards for Equipment Leaks* (Subpart BB)

  WAC 173-303-691, Dangerous Waste Regulations – A*ir emission standards for equipment leaks*, applies to facilities that treat, store, or dispose of hazardous waste, and regulates air emissions from equipment that contains or contacts hazardous wastes with organic concentrations of at least 10 percent by weight (wt%). WAC 173-303-691 incorporates 40 CFR 264, Subpart BB, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – *Air Emission Standards for Equipment Leaks*, by reference. This provision does not apply to the WTP, because the WTP will not accept wastes with organic concentrations at or above 10 wt%. (refer to Section 3C.5)

- *Air Emission Standards for Tanks, Surface Impoundments, and Containers* (Subpart CC)

  The regulations specified under WAC 173-303-692, Dangerous Waste Regulations – *Air emission standards for tanks, surface impoundments, and containers*, and 40 CFR 264, Subpart CC, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – *Air Emission Standards for Tanks, Surface Impoundments, and Containers*, incorporated by reference, do not apply to the WTP mixed waste tank systems and containers. These tanks and containers are excluded under WAC 173-303-692(1)(b)(vi) because they qualify as waste management units "…used solely for the management of radioactive mixed waste in accordance with all applicable regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act." Containers or tanks bearing nonradioactive, dangerous waste (e.g., maintenance and laboratory waste) that are not excluded under WAC 173-303-692(1)(b)(ii) or 40 CFR 264.1082(c) will comply with the container and tank standards specified under 40 CFR 264, Subpart CC, as applicable.

## 3C.7 RECORDKEEPING

Records generated for environmental compliance will be legible, identifiable, and retrievable, and will be protected against damage, deterioration, or loss. Requirements and responsibilities for record transmission, distribution, retention, maintenance, and disposal will be established and documented. The requirements contained in WAC 173-303-380(a, b, and c), Dangerous Waste Regulations – *Facility recordkeeping*, are addressed in this WAP and will be managed through the waste tracking system record-keeping policies. Additional requirements listed under WAC 173-303-380 are addressed in

the QAPjP. Records generated to support activities described in this WAP will be considered QA records. These may be in electronic or hard copy format and will be managed according to the requirements outlined in the QAPjP.

The following documents that support this WAP are considered QA records:

- Sample information provided by the Tank Operations Contractor, including constituents of concern from sampling activities, laboratory analysis results, waste certifications, and shipping and transfer papers.
- Documentation used for any discrepancy resolution and nonconformance action.
- Confirmation volume measurement data, including any discrepancy resolution.
- Documentation used for LDR evaluation.
- Sampling and analytical data developed for meeting the waste acceptance criteria of receiving facilities.
- Calibration data from analytical equipment.
- Shipment and waste transfer documentation, including waste profile sheets and LDR information forms.

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**Table 3C-6 Waste Feed Analysis, Waste Acceptance Criteria, and Nonconformance Actions**

| Parameter | Analytical Method[a,b] | Target Minimum Reportable Quantity | Acceptance Criteria | Nonconformance Actions |
|---|---|---|---|---|
| TOC using persulfate oxidation method | 9060A | 1 wt% | TOC < 10 wt% | Reject waste feed |
| PCBs | 8082A | 0.025-0.05 mg/L (supernate) | PCBs < 50 ppm | Reject waste feed |
| pH | pH meter, 9040C | Not established; per the method, bracket the expected pH of the sample by three pH units or more apart during calibration | Acceptable pH >12 | Corrective actions to correct pH |
| Compatibility | ASTM D5058-90 | Temperature Change = 1 °C | Acceptable temperature change < ± 20 °C<br>No viscosity change adversely affecting waste processing | Corrective actions to eliminate incompatible conditions |
| RCRA Metals:<br>Sb, As, Ba, Be, Cd, Cr, Pb, Ni, Se, Ag, Tl[c] | 6010D | 0.05-015 mg/L (supernate) | per Permit Conditions Table III.10.H.D | Determination of toxicity characteristic metals, underlying hazardous constituents |
| Hg | 7470A or 7471B | 0.025-1.0 mg/L (supernate) | Hg < 1.4E-05 mol/mol sodium | Determination of toxicity characteristic metals |
| Inorganic Anions – Ratio to Sodium (Cl, F, SO4) | 9056A | 150-500 mg/L (supernate) | Cl < 3.7E-2 mol/mol sodium<br>F < 9.1E-2 mol/mol sodium<br>SO4 < 7.0E-2 mol/mol sodium | Corrective actions to eliminate incompatible conditions |
| Ammonia/ammonium | SM 4500-$NH_3$-F or EPA Method 350.1 or Method 350.3 | 0.08-15.0 mg/L (supernate only) | Ammonia/Ammonium < 0.04 M | Corrective actions to eliminate incompatible conditions |

[a]Methods are from EPA SW-846, as amended, unless otherwise indicated. The specified method revision or newer will be used.

[b]Since many types and sizes of glassware and supplies are commercially available, and since it is possible to prepare reagents and standards in many different ways, the apparatus, reagents, and volumes included in these methods may be replaced by any similar type as long as this substitution does not affect the overall quality of the analysis.

[c]The acceptance criteria for RCRA metals refers to the limiting feed rate of RCRA metals into the melter, as determined by the Environmental Performance Demonstration Test. This acceptance criterion does not apply to the acceptance of DST waste into the LAW Facility.

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