



# ICD 30 – Interface Control Document for DFLAW Feed

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**Department:** Project Management

**NOTE:** Obtain concurrence and approval signatures on the following page prior to approval of this ICD.

**Approved by:** Walt Taylor

*Walt Taylor*      27JUL2021  
\_\_\_\_\_  
Signature      Date

**BNI Area Project Manager**

**Issue Status:** Approved

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**NOTE: This document contains information pertinent to an accident analysis calculation and receives a safety screening from NSE, in accordance with procedures, anytime the document is modified.**

**NOTE: This document defines current service needs, future needs, and service gaps. The identified service levels do not represent contractual obligations between service recipient and providers. Future contractual and funding actions to close service gaps will be accomplished by integration between the federal offices as part of the budget planning process.**


## Interface Signature Page

Interface organizations, as appropriate, sign this sheet indicating concurrence and approval with the ICD contents. These signatures signify that the ICD accurately reflects the current baselines of interface organization's contracts, except as indicated in Appendix A, ICD 30 Issues and Open Items. The BNI Area Project Manager does not approve this ICD until all required signatures on this page have been obtained.

### Contractor Concurrence

| Organization   | Position               | Name           | Signature  | Date      |
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### DOE Approval

| Position  | Name         | Signature  | Date  |
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## History Sheet

| Rev | Date       | Reason for revision  | Revised by              |
|-----|------------|--|-------------------------|
| 0   | 14-Sep-15  | Initial issue  | D. Reinemann<br>M. Pell |
| 1   | 27-July-21 | <p>Revised per Scoping Checklist CCN 315284. Updated per 24590-WTP-GPP-RAOS-OS-0001 to add requirements. Added Sections 3, 4, and 5 and revised Appendixes based on current ICD template. Due to extensive changes, revision bars are not used.</p> <p>Incorporated the following changes:<br/>24590-WTP-ICF-MGT-17-0002<br/>24590-WTP-ICF-MGT-19-0002<br/>24590-WTP-ICF-MGT-19-0003.</p> <p>Modified requirement sections 3.1.1.11, 3.1.2.2, 3.3.1.4, 3.3.2.4, and 3.3.2.6.</p> <p>Added requirement section 3.3.1.5 based on BNI Contract Modification 481.</p> <p>Reviewed and addressed impact evaluations for incorporation:<br/>24590-WTP-EIE-NS-17-0001<br/>24590-WTP-EIE-NS-19-0001.</p> | D Reinemann             |

## Revision Description

| ICD Section | Description  |
|-------------|--|
| All         | This ICD has been reformatted in accordance with the requirements of the procedure for <i>Interface Control Documents</i> (24590-WTP-GPP-RAOS-OS-0001, Rev 3).   |
| 1.1         | Renamed section to “Interface Scope”   |
| 1.2         | Inserted new section, “System Overview” and added new content. Added new interface block diagram as Figure 1.  |
| 1.2         | Revised definitions of “campaign” and “batch” in footnotes.  |
| 1.3         | Renamed Rev 0 Section 1.2 to “Interface Functions”   |
| Table 1     | Renamed Table 1 and simplified content to describe interface functions.  |
| 2           | Renamed section to “Interface Background Information” and inserted introductory paragraph.   |
| 2.1         | Renamed subsection to “Physical Information”. Deleted all statements that are now covered as requirements in Section 3.  |
| 2.1.1       | Renamed subsection to “Transfer Pipeline”. Deleted Table 2 and Table 3 from Rev 0. Deleted Section 2.1.1.1 from Rev 0.   |
| 2.1.2       | Renamed subsection to “Data Transfer”. Added new paragraph.  |
| 2.1.3       | Renamed subsection to “Commissioning”. Added new paragraphs.   |
| 2.1.4       | Deleted Rev 0 Section 2.1.4. Information for transfer pipeline completion is included in Section 2.1.1.  |
| 2.2         | Renamed subsection to “Administrative Information”   |
| 2.2.1       | Renamed subsection to “Safety Information”. Moved appropriate paragraphs from Rev 0 into this section. Moved interface milestones to Section 2.2.4. Added new Section 2.2.1.1 for LAW DSA and Section 2.2.1.2 for Tank Farms DSA. Moved paragraph on criticality from Rev 0 to Section 2.2.1.3. Added new Table 2 for LAW DSA SAC. |
| 2.2.2       | Renamed subsection to “Regulatory Information”. Added new paragraphs.  |
| 2.2.3       | Renamed subsection to “Post-Commissioning/Maintenance”. Moved appropriate paragraphs from Rev 0 into this section.   |
| 2.2.3.1     | Added new subsection for DFLAW feed planning. Moved appropriate paragraphs from Rev 0 into this section. Inserted new 3 <sup>rd</sup> paragraph.   |
| 2.2.3.2     | Added new subsection for DFLAW transfer process. Created new logic diagram as Figure 2. Added new paragraph for EMF evaporator concentrate transfer coordination.  |
| 2.2.3.3     | Added new subsection for transfer pipeline flushing. Moved appropriate content from Rev 0 into this section.   |
| 2.2.3.4     | Added new subsection for interface maintenance and operations. Moved appropriate paragraphs from Rev 0 into this section. Inserted new paragraph for pneumatic testing. Added paragraph for LCP operating manual.  |
| 2.2.4       | Renamed section to “Interface Milestones”. Added new Table 3 to list interface milestones which reference the DFLAW Integrated Schedule.   |
| 2.3         | Renamed subsection to “Acceptance Criteria”. Updated section to reflect current feed qualification program. Modified Table 4 to include parameters for glass formulation, RCRA metals from DWP, species for ICD 31 effluent waste compatibility analysis, and oxalate. Revised Table 4 notes.                                      |
| 2.3         | In Table 5, Added two parameters from 24590-WTP-ICF-MGT-19-0002. Changed maximum sodium concentration to 7M. Revised Note 9.   |

## Revision Description

| ICD Section | Description  |
|-------------|--|
| 2.3.1       | Re-named section to “DFLAW Feed Qualification”. Added new content to align with current feed qualification program. Criticality information from Rev 0 was moved to Section 2.2.1.         |
| 2.3.2       | Added new subsection for treated LAW feed data. Added new paragraph based on the current feed qualification program.   |
| 2.3.3       | Added new subsection for DFLAW feed campaign acceptance. Added new paragraphs based on the current feed qualification program.   |
| 2.4         | Deleted Section 2.4 from Rev 0. Configuration management is covered under specific requirements in Section 3. Deleted Rev 0 Table 6.   |
| 2.5         | Deleted Section 2.5 from Rev 0. Appropriate content was moved into Section 2.3.  |
| 2.6         | Deleted Section 2.6 from Rev 0. Appropriate content was moved into Section 2.2.3.  |
| 2.7         | Deleted Section 2.7 from Rev 0. Appropriate requirements are listed in Section 3. Deleted Rev 0 Table 7.   |
| 3           | Added new section, “Requirements,” and subsections to address technical, activity level, and programmatic requirements. Moved Rev 0 References to Section 5.                               |
| 3.1         | Added to address Technical Requirements (Design Criteria). Content is from 24590-WTP-ICF-MGT-19-0002, with additional changes described below for specific sections.                       |
| 3.1.1.2     | Added BNI 2016e to Requirement Source. Moved BNI 2019c to Implementation.  |
| 3.1.1.3     | Added WRPS 2020c as a Requirement Source.  |
| 3.1.1.6     | Added WRPS 2020a as a Requirement Source.  |
| 3.1.1.8     | Added WRPS 2020a as a Requirement Source.  |
| 3.1.1.11    | Revised requirement statement for clarity. Revised requirement basis. Deleted BNI 2018d and BNI 2018e as Requirement Sources and added BNI 2018j, BNI 2018k, and WRPS 2020c.               |
| 3.1.2.2     | Revised requirement basis. Added WRPS 2020c as a Requirement Source.   |
| 3.1.2.4     | Changed requirement statement to “an equivalent of 3 feet.”  |
| 3.1.2.7     | Added BNI 2016e to Requirement Source.   |
| 3.1.2.8     | Added WRPS 2020a as a Requirement Source.  |
| 3.1.2.9     | Added WRPS 2020a as a Requirement Source.  |
| 3.2         | Added to address Activity Level Requirements.  |
| 3.3         | Added to address Programmatic Requirements. Content is from 24590-WTP-ICF-MGT-19-0003, with additional changes described below for specific sections.                                      |
| 3.3.1.4     | Revised requirement statement to include lockout/tagout and system configuration changes.  |
| 3.3.1.5     | Added new requirement for WTP to flush the transfer line.  |
| 3.3.2.4     | Revised Requirement Basis for description of Inventory Forecasting Tool.   |
| 3.3.2.6     | Revised requirement statement to include AP-06A pit cover block removal and lockout/tagout. Added paragraph to Requirement Basis for SAC 5.8.10. Added WRPS 2020b as a Requirement Source. |
| 3.3.2.7     | Deleted total gamma inventory from requirement. Deleted last paragraph of the Requirement Basis.   |
| 4           | Added new section, “Requisite Interface Items,” and subsections to address WTP Contractor, and TOC requisite items.  |

## Revision Description

| ICD Section | Description  |
|-------------|--|
| 4.1         | Added to address WTP Contractor Requisite Interface Items. Added 4.1.1 from 24590-WTP-ICF-MGT-19-0003.   |
| 4.2         | Added to address TOC Requisite Interface Items.  |
| 4.2.1       | Added new item to address inadvertent transfer.  |
| 5           | Added as “References”. Various references were deleted and added to support this revision.   |
| Appendix A  | Re-labeled as ICD 30 Issues and Open Items. Changed table format to align with ICD Action Items List.  |
| Appendix B  | Deleted from Rev 0. Closed ICD issues are identified in Appendix A. Moved Definitions from Rev 0 Appendix E into Appendix B. Definitions were updated. |
| Appendix C  | Deleted from Rev 0. New open items are listed in Appendix A.   |
| Appendix D  | Deleted from Rev 0.  |
| Appendix E  | Deleted from Rev 0. Definitions were moved to Appendix B.  |

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## Acronyms

|          |   |
|----------|---|
| BNI      | Bechtel National, Incorporated                        |
| BOF      | Balance of Facilities                                 |
| CRV      | concentrate receipt vessel                            |
| CSER     | criticality safety evaluation report                  |
| DEP      | direct feed LAW effluent management facility process  |
| DFLAW    | direct feed low-activity waste                        |
| DOE      | US Department of Energy                               |
| DQO      | data quality objective                                |
| DSA      | Documented Safety Analysis                            |
| DST      | double-shell tank                                     |
| DWP      | Dangerous Waste Permit                                |
| EMF      | Effluent Management Facility                          |
| ICD      | interface control document                            |
| ILAW     | immobilized low-activity waste                        |
| ILST     | interim LAW storage tank                              |
| LAW      | low-activity waste                                    |
| LCP      | LAW concentrate receipt process system                |
| ORP      | US Department of Energy, Office of River Protection   |
| PCB      | polychlorinated biphenyl                              |
| P&ID     | pipng and instrumentation diagram                     |
| PROFIBUS | process field bus                                     |
| RAM      | requirement area manager                              |
| RCRA     | Resource Conservation and Recovery Act                |
| RLD      | radioactive liquid waste disposal                     |
| RPP      | River Protection Project                              |
| SAC      | specific administrative control                       |
| TOC      | Tank Operations Contractor                            |
| TSCR     | tank side cesium removal                              |
| TSR      | technical safety requirement                          |
| WAC      | Washington Administrative Code                        |
| WRPS     | Washington River Protection Solutions                 |
| WTP      | Hanford Tank Waste Treatment and Immobilization Plant |

# 1 Interface Description

## 1.1 Interface Scope

This interface control document (ICD) describes the physical and administrative interactions that allow for the direct transfer of Hanford Tank Farms treated low-activity waste (LAW) feed from the Tank Operations Contractor (TOC) to the Hanford Tank Waste Treatment and Immobilization Plant (WTP) LAW Facility. This mode of operation is known as direct feed LAW (DFLAW). This document does *not* cover the direct transfer of Hanford tank waste to any other WTP facility.

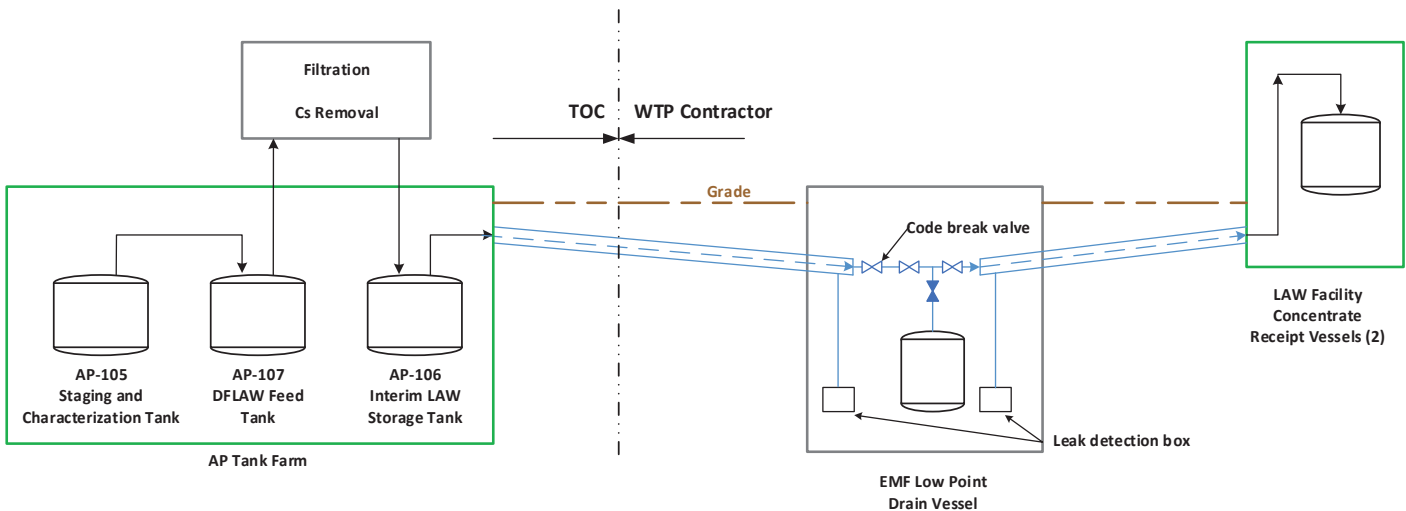
Treated LAW feed is prepared by the TOC in the AP Tank Farm. Through the DFLAW feed qualification program, the treated LAW feed composition and properties are evaluated against the waste acceptance criteria in this ICD. Qualified treated LAW feed is then transferred from the AP Tank Farm directly to the WTP LAW Facility for vitrification.

The requirements and other information in this ICD are subject to change based on the final LAW Facility and Tank Farm operating group permits that are approved and issued by the Washington State Department of Ecology.

## 1.2 System Overview

The interface for the transfer of treated LAW feed for DFLAW operation is illustrated in Figure 1.

**Figure 1 DFLAW Feed Transfer Interface**



The TOC uses a dedicated double-shell tank (DST) for staging and characterizing Tank Farm supernatant. A feed campaign<sup>1</sup> is prepared by blending and adjusting supernatant from various Tank Farm sources in this DST to meet a target composition. Samples from this DST are used as the primary basis for feed qualification. When this campaign is accepted, it is transferred to the DFLAW Feed Tank (AP-107). From this DST, the DFLAW feed is pumped to a nearby treatment system to remove solids and

<sup>1</sup> A campaign is defined as a volume of staged feed, nominally in a 1M gallon DST, that is to be treated using a similar processing strategy.

radioactive Cesium-137. The treated LAW feed is then collected in the Interim LAW Storage Tank (ILST) (AP-106) for batch<sup>2</sup> transfer to the WTP LAW Facility.

The initial campaign for WTP hot commissioning has already been established in the DFLAW Feed Tank (AP-107). The TOC has completed re-purposing of the ILST (AP-106) to remove constituents that are outside of the LAW Facility waste acceptance criteria, and the ILST (AP-106) is ready to accept treated LAW feed.

The initial Tank Farm pretreatment system is the Tank Side Cesium Removal (TSCR) system. TSCR is a basic filtration and ion exchange system that utilizes a non-elutable resin. TSCR will be located adjacent to the AP Tank Farm and is intended to operate for the initial DFLAW configuration. TSCR is a demonstration project with a projected lifespan of five years. Additional treatment capacity will be needed for the remainder of DFLAW operations.

The WTP receives the treated LAW feed through a dedicated underground coaxial transfer line. The transfer line is connected to existing piping in the LAW Facility to deliver the treated LAW feed to the LAW Concentrate Receipt Vessels (CRV). The CRVs deliver the treated LAW feed to the LAW melter feed preparation process. Due to site elevations, a low point drain vessel is provided at the WTP Effluent Management Facility (EMF) to facilitate draining of flush water from the transfer line. A code break valve (see Section 3.1.1.2) was added in the EMF to satisfy ASME B31.3, *Process Piping*.

### 1.3 Interface Functions

Table 1 presents the general interface functions and corresponding responsibilities for each interfacing contractor. Requirements derived from these functions are listed in Section 3 for each contractor.

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<sup>2</sup> A batch is defined as a discrete volume of treated LAW feed transferred from the Interim LAW Storage Tank (AP-106) to a LAW Facility Concentrate Receipt Vessel.

**Table 1 Functions of the DFLAW Feed Interface**

| <b>Interface Function</b>   | <b>WTP Contractor Responsibility</b>   | <b>TOC Responsibility</b>  |
|---|--|--|
| Provide a transfer pipeline for the transfer of treated LAW feed.                         | Provide a transfer line from the LAW Facility to the WTP/Tank Farm interface.  | Provide a transfer line from the AP Tank Farm to the WTP/Tank Farm interface.  |
| Provide data communication for the transfer of treated LAW feed.                          | Provide a signal transmission line from the LAW Facility to the WTP/Tank Farm interface.   | Provide a signal transmission line from the Tank Farm control system to the WTP/Tank Farm interface.   |
| Establish waste acceptance criteria for treated LAW feed.                                 | Develop waste acceptance criteria consistent with the LAW Facility design, safety basis, and permit requirements.  | Provide treated LAW feed that meets the waste acceptance criteria.   |
| Coordinate planning for treated LAW feed transfers.                                       | Coordinate with the TOC to establish feed vectors and plan DFLAW feed campaigns.   | Coordinate with the WTP Contractor to establish feed vectors and plan DFLAW feed campaigns.  |
| Establish responsibilities for operation and maintenance.                                 | Develop operating procedures for transfer and receipt of treated LAW feed. Maintain transfer system components from the LAW Facility to the WTP/Tank Farm interface. | Develop operating procedures for transfer of treated LAW feed. Maintain transfer system components from Tank Farms to the WTP/Tank Farm interface.           |
| Establish a program for qualification and acceptance of treated LAW feed.                 | Develop qualification methodology.   | Develop the sampling approach and qualification methodology.   |
| Establish parameters for treated LAW feed transfer and flushing of the transfer pipeline. | Develop transfer parameters consistent with the LAW Facility and AP Tank Farm designs. Establish control signals and interlocks for transfer and flushing.           | Implement transfer parameters consistent with the LAW Facility and AP Tank Farm designs. Establish control signals and interlocks for transfer and flushing. |

## 1.4 Special Interface Roles

N/A

# 2 Interface Background Information

This section only contains background information pertinent to the interface. For requirements, along with their basis, implementation, and configuration management, see Section 3. Other actions needed to complete the interface are listed in Section 4.

## 2.1 Physical Information

The transfer line physical interface for the treated LAW feed from the Tank Farms to the LAW Facility is located near the WTP site boundary (Node 13) as shown on the *Interface Control Drawing*, 24590-WTP-B2-C12T-00001 (BNI 2019k). The interface for the control system signal lines between the WTP Contractor and the TOC is located on the telecommunications pole identified as Node 18, as shown on the *Interface Control Drawing*.

### 2.1.1 Transfer Pipeline

Design requirements for the transfer pipeline are listed in Section 3.1.1 for the WTP Contractor and Section 3.1.2 for the TOC. The TOC side of the transfer pipeline includes a section of existing pipeline that was constructed for Project W211 to provide feed from AP Tank Farm to the WTP Pretreatment Facility. The TOC provides a new underground pipeline section from the W211 lines to interface Node 13. The WTP Contractor provides new underground pipeline sections from Node 13 to the EMF and from the EMF to the LAW Facility, where it ties into the existing feed transfer line from the Pretreatment Facility to the LAW Facility. The unused sections of the existing transfer lines are cut and capped at the tie-in locations.

Although each contractor uses a different pipe specification or pipe code for the new sections of the transfer pipeline, the pipe materials selected by the WTP Contractor and TOC are intended to be equivalent.

The sequence for the final LAW feed transfer pipeline connection follows the sequence of each contractor's project schedule activities. The WTP Contractor has completed installation of a pipeline section at interface Node 13. Schedule activities and resource availability for each contractor are not expected to align in a manner that facilitates joint integrity testing.

Prior to installing the final connection of the transfer pipeline at completion, each contractor independently constructs and performs pressure testing and any nondestructive examination for their side of the transfer pipeline up to interface Node 13. The WTP contractor plans to cap the encasement line at the interface point to afford the TOC access for preparation and performance of the closure welds. The TOC installs the final pipe spool, performs the closure weld and the necessary nondestructive examination to complete the tie-in of their portion of the line, and installs the remaining insulation (see Section 3.1.2.3).

## 2.1.2 Data Transfer

Design requirements for data transfer are listed in Section 3.1.1 for the WTP Contractor and Section 3.1.2 for the TOC Contractor. *Mission Integration Waste Feed Delivery Controls*, 24590-WTP-RPT-OS-19-001 (BNI 2019t), documents the initial discussions between the WTP Contractor and the TOC regarding the controls philosophy to be implemented for transfers of treated LAW feed. *Recommended Approach to Control System Interfaces for ICD-05, ICD-06, ICD-30, and ICD-31*, RPP-RPT-61745 (WRPS 2020a) provides the details of the recommended control system concepts for consideration.

## 2.1.3 Commissioning

Prior to the start of hot commissioning, the WTP Contractor certifies to the Office of River Protection (ORP) that the WTP is ready to receive radioactive waste. The WTP Contractor also submits a waste transfer notification to the ORP Contracting Officer to establish the date for the first batch transfer of treated LAW feed. After these actions are complete, the WTP Contractor is required to obtain approval from ORP to introduce radioactive waste to the WTP. (*DFLAW Commissioning Plan*, 24590-WTP-PL-RACT-CG-0001, [BNI 2020f])

Before the first batch transfer, verification of the transfer interface, including equipment, control system functions, and protocols is needed. The TOC and the WTP Contractor may separately test their respective components of the treated LAW transfer system to verify performance. Commissioning may include an integrated test of the treated LAW feed transfer pipeline by transfer of water from the WTP to the AP Tank Farm. The WTP Contractor can provide water for an in-service leak test of Tank Farm jumper connections as specified by the TOC to demonstrate compliance with tightness testing requirements in the Washington Administrative Code. Description of the verification approach for the transfer system will be developed as part of the WTP commissioning program development. (*DFLAW Commissioning Plan*, [BNI 2020f])

## 2.2 Administrative Information

### 2.2.1 Safety Information

The respective organizations' design requirements include integrated safety management principles and are communicated through the interface in the requirements documents, which are identified in Section 3.

No new hazards or accident scenarios are expected to be introduced through this interface that are not adequately controlled by the interface contractors and by controls placed across this interface. A specific Process Hazards Analysis was conducted to evaluate potential hazards associated with the transfer of treated LAW feed (RPP-RPT-61706, under development by WRPS). The physical and administrative controls to mitigate these risks using a graded approach will be adequately addressed through requirements on each contractor's authorization basis.

Each contractor is responsible to manage and implement its safety management programs. For activities involving the interfacing systems, the demarcation between the WTP Contractor and the TOC safety management programs is at the WTP site boundary since each contractor is responsible for the design and installation of their side of the transfer pipeline to this point.

#### 2.2.1.1 LAW Facility Documented Safety Analysis

The *Documented Safety Analysis for the Low-Activity Waste and Effluent Management Facilities (LAW DSA)*, 24590-LAW-DSA-NS-18-0001 (BNI 2021f), Section 4.5.1.1, identifies a waste acceptance criteria

specific administrative control (SAC) to ensure that key LAW Facility safety analysis conclusions regarding treated LAW feed constituents and properties are protected for each transfer. The SAC protects the LAW and EMF hazard categorizations, toxicological consequences, and radiological consequences. The LAW DSA requires that the performance criteria in the SAC are to be verified prior to transfers into the LAW CRVs. The SAC values and their bases are listed in Table 4.5-2 of the LAW DSA. The SAC performance criteria are summarized in Table 2 below:

**Table 2 LAW DSA SAC Criteria**

| LAW DSA SAC Parameter                     | Compared to ICD 30 Acceptance Criteria (Table 5)   |
|---|--|
| Gross alpha inventory                     | Greater than ICD 30 transuranic value<br>SAC provides margin by including all alpha emitters |
| Strontium-90 inventory                    | Greater than ICD 30 value  |
| Sodium concentration                      | Maximum value is the same as ICD 30; LAW DSA has no minimum value                            |
| Molar ratio of (nitrate + nitrite)/sodium | Same value   |
| Unit sum of fractions                     | Same value   |
| Sulfate ratio                             | Same value   |
| Unit hydrogen generation rate             | Same value   |

The LAW DSA SAC are met if the ICD 30 acceptance criteria are met.

Section 5.7.1 of the LAW DSA references the source inventory control provisions of the *Tank Farms Technical Safety Requirements* (TSR), HNF-SD-WM-TSR-006 (WRPS 2018a). Section 5.7.2 of the LAW DSA references the waste stream transfer provisions of the Tank Farms TSR.

The *Low-Activity Waste and Effluent Management Facilities Technical Safety Requirements* (LAW TSR), 24590-LAW-TSR-NS-18-0001 (BNI 2021g), Section 5.5.1, establishes the SAC as nonprogrammatic administrative controls to provide preventative and (or) mitigative functions for specific potential accident scenarios.

### 2.2.1.2 Tank Farms Documented Safety Analysis

The *Tank Farms Documented Safety Analysis*, RPP-13033 (WRPS 2019b) and *Tank Farms Technical Safety Requirements*, (WRPS 2018a), establish safety controls to protect various safety structures, systems and components and supporting assumptions. *Tank Farms Operations Administrative Controls*, HNF-IP-1266 (WRPS 2018b), provides further implementation details for the administrative controls. The safety controls established that involve the interface are:

- Admin Control 5.7 Waste Leak Evaluation Program
- SAC 5.8.5, Waste Transfer System Overpressure and Flow Transient Protection
- SAC 5.8.6, Double Valve Isolation
- SAC 5.8.8, Freeze Protection
- SAC 5.8.10, AP-02D and AP-06A Cover Block Removal (under development)
- Design Feature 6.1, Waste Transfer Primary Piping System

- Design Feature 6.3, Isolation Valves for Double Valve Isolation

The waste transfer primary piping and its safety function of providing confinement of waste involve these related controls that support the waste transfer primary piping safety function to minimize the likelihood of a waste transfer leak accident.

### 2.2.1.3 Criticality

Criticality for DFLAW is evaluated in the *Criticality Safety Evaluation Report for Direct Feed to the Low-Activity Waste Facility*, 24590-WTP-CSER-NS-16-0001 (DFLAW CSER) (BNI 2021h). The DFLAW CSER concludes that treated LAW feed remains subcritical under all normal and credible abnormal conditions with the assurance of verification that the feed meets the treated LAW feed acceptance criteria (Table 5) and the waste acceptance criteria in the LAW DSA before it is transferred to the LAW Facility. Modifications to the treated LAW feed acceptance criteria will require evaluation against the process analysis performed in the DFLAW CSER.

### 2.2.2 Regulatory Information

The initial data collection requirements for treated LAW feed acceptance are documented in *Integrated DFLAW Feed Qualification Data Quality Objectives*, 24590-LAW-RPT-PENG-16-003 (RPP-RPT-59494) (BNI 2020p), which is referred to in this ICD as the DFLAW DQO.

The WTP section of the Hanford Dangerous Waste Permit (DWP) (WA7890008967) Chapter 3C contains a Waste Analysis Plan for the DFLAW configuration. This Waste Analysis Plan describes general requirements for the sample collection and regulatory analysis of waste to be processed at WTP and is intended to reflect the outcome of the DFLAW DQO (BNI 2020p). Table 3C-6 in the Waste Analysis Plan for DFLAW provides a list of waste analysis parameters and analytical methods required by the DWP.

### 2.2.3 Post-Commissioning/Maintenance

#### 2.2.3.1 DFLAW Feed Planning

The feed vector represented in *Feed Vector Development in Support of WTP Environmental Risk Activities*, 24590-WTP-RPT-ENV-16-001 (RPP-RPT-58656), (BNI 2016r) has been accepted for use in DFLAW operations per CCN 295271 (BNI 2017e). This feed vector is based on 100% recycle of EMF concentrate to the LAW Facility.

The current TOC waste feed delivery plan for DFLAW hot operations is listed in *Integrated Waste Feed Delivery Plan, Volume 2 – Campaign Plan*, RPP-40149-VOL2 (WRPS 2019a). The *Campaign Plan* lists 27 campaigns and their source tanks planned for DFLAW operations. This list of campaigns is not definitive and is subject to change as new information becomes available.

The TOC is developing an Inventory Forecasting Tool to provide the WTP Contractor with an estimate of the composition of the treated LAW feed stored in the ILST (AP-106). This data, along with process data from the EMF Evaporator Concentrate Vessels and the LAW CRVs, is used as inputs to the initial run of the LAW Glass Algorithm.

*Batch Processing Methodology for the Low Activity Waste Facility*, 24590-LAW-RPT-PENG-16-004 (BNI 2020m), describes the flowdown of qualification data, WTP analytical results, and process knowledge that inform process control and processing decisions. After acceptance of a DFLAW feed

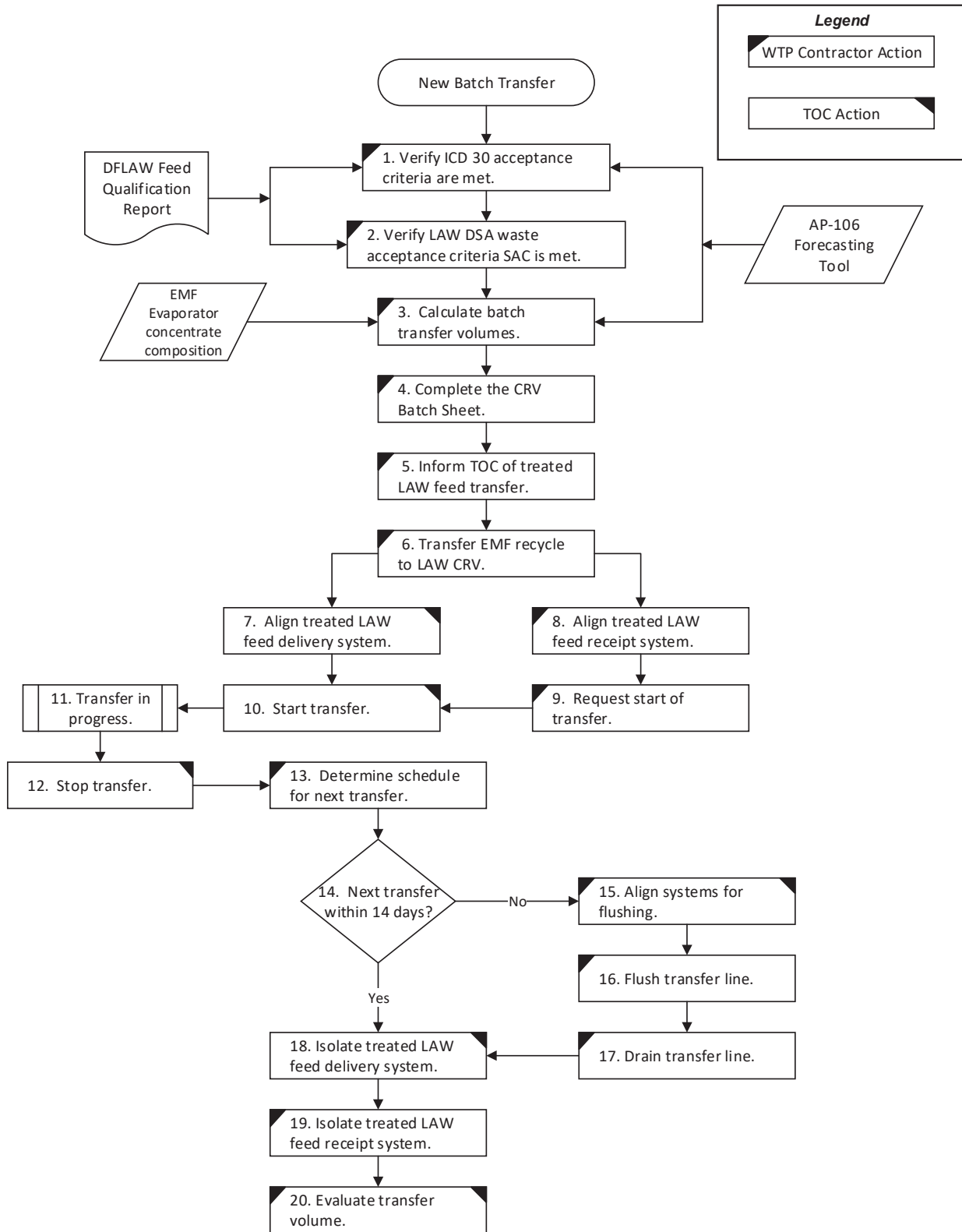


campaign, the WTP Contractor develops a LAW Facility Campaign Sheet that uses results from feed qualification and the LAW Glass Algorithm for process planning. Before each batch transfer from the TOC to the LAW Facility, the WTP Contractor develops a CRV Batch Sheet to identify information needed to transfer treated LAW feed and EMF recycles into one of the CRVs, including the target volume for each transfer. The CRV Batch Sheet also communicates the verification of the LAW DSA waste acceptance criteria SAC.

### **2.2.3.2 DFLAW Transfer Process**

The coordination of the WTP Contractor and the TOC to perform the transfer of treated LAW feed to the WTP is shown in Figure 2.:

Figure 2 Treated LAW Feed Transfer Logic Diagram



1. **Verify ICD 30 acceptance criteria are met.** The WTP Contractor reviews data from the DFLAW Feed Qualification report, the AP-106 Forecasting Tool, and other information from the TOC.
2. **Verify LAW DSA waste acceptance criteria SAC is met.** The WTP Contractor follows the LAW TSR direction.
3. **Calculate batch transfer volumes.** The WTP Contractor performs the initial LAW Glass Algorithm run using data from the AP-106 Forecasting Tool, EMF Evaporator concentrate composition, and LAW CRV heel volume and composition. The results provide the target volumes for treated LAW feed and EMF recycle.
4. **Complete the CRV Batch Sheet.** The WTP Contractor uses the results from the LAW Glass Algorithm, the LAW Campaign Sheet, and other process information to fill out the CRV Batch Sheet as an instruction for the next transfer.
5. **Inform TOC of treated LAW feed transfer.** The WTP Contractor informs the TOC of the plan for the next transfer of treated LAW feed. This coordination includes verification that TOC can provide the target volume of feed within the time needed after the transfer of concentrate from EMF (see paragraph below). The CRV Batch Sheet can be used for planning purposes.
6. **Transfer EMF recycle to a LAW CRV.** Prior to receiving treated LAW feed from the TOC, the WTP Contractor completes an internal transfer from the EMF.
7. **Align treated LAW feed delivery system.** The TOC ensures that the correct transfer path is established, verifies that any alarms and interlocks are clear, and sets the ready to transfer status.
8. **Align treated LAW feed receipt system.** The WTP Contractor ensures that the correct transfer path is established, verifies that any alarms and interlocks are clear, and sets the ready to receive status.
9. **Request start of transfer.** The WTP Contractor requests the TOC to start the transfer of treated LAW feed.
10. **Start transfer.** The TOC starts the AP Tank Farm transfer pump.
11. **Transfer in progress.** The AP Tank Farm transfer pump continues to operate as long as the target transfer volume has not been reached and the transfer permissive is not removed.
12. **Stop transfer.** The TOC initiates shutdown of the AP Tank Farm transfer pump when the target transfer volume is reached or the transfer permissive is removed.
13. **Determine schedule for next transfer.** The WTP Contractor evaluates current operations for the next delivery of feed, considering potential delays.
14. **Next batch within 14 days?** If yes, go to step 18. If no, proceed to the next step.
15. **Align system for flushing.** The WTP Contractor and the TOC align their respective systems to prepare for transfer line flushing.
16. **Flush transfer line.** The WTP Contractor flushes the transfer line from the EMF back to the AP Tank Farm.
17. **Drain transfer line.** The WTP Contractor changes the transfer line valve alignment to drain flush water into the EMF Low Point Drain Vessel.
18. **Isolate treated LAW feed delivery system.** The TOC isolates the AP Tank Farm feed delivery system.
19. **Isolate treated LAW feed receipt system.** The WTP Contractor isolates the feed receipt system.
20. **Evaluate transfer volume.** The WTP Contractor and the TOC share information to verify that the volume of treated LAW feed delivered is consistent with the volume received.

The TOC and WTP Contractor will prepare detailed procedures for transferring treated LAW feed into the WTP Contractor's CRVs. Figure 2 provides transfer procedure concepts whose elements could be incorporated in the operating procedures when developed. The transfer procedure concepts in Figure 2 do not drive requirements on the transfer process; instead, concepts have been developed and presented to help identify and understand the interfaces between the TOC and the WTP Contractor for internal planning purposes. As preliminary information, it is subject to change through further refinement as the project matures.

Coordination of treated LAW feed transfers is needed to support WTP Contractor commitments for EMF evaporator concentrate transfers. The intent is to minimize the exposure of the 316L stainless-steel transfer pipeline between the EMF and the LAW Facility to the high chloride concentration in the evaporator concentrate. According to agreements with ORP in *DFLAW 316L Transfer Line Material Requirements*, CCN 296684 (BNI 2017f), and detailed in *Type 316L in Lieu of AL6XN EMF Concentrate Transfers*, 24590-BOF-DGCE-MS-16-00022 (BNI 2017g), the WTP Contractor coordinates with TOC to ensure that TOC is ready to transfer feed after the concentrate transfer is complete. The targeted time frame is to complete the feed transfer within three hours of the concentrate transfer. If TOC is unable to support this time frame, then the WTP Contractor has agreed to conduct additional flushing with a caustic solution of the transfer pipeline between the EMF and the LAW Facility. The details of the operational sequence are contained in Section 5.1.1.1.1 of *WTP Direct Feed LAW Integrated Processing Strategy Description*, 24590-WTP-PL-PE-16-0001 (BNI 2020k). The WTP technical requirement for this transfer has been established in Section 3.15.1.2.7 of *EMF Design Description and System Design Descriptions (ACV, CIV, DEP, DVP)*, 24590-BOF-3ZD-25-00001 (BNI 2020j).

### 2.2.3.3 Transfer Pipeline Flushing

If the next transfer of feed is expected to be more than 14 days after a treated LAW feed transfer, then the WTP Contractor flushes the transfer pipeline with a volume of water that is at least 1.5 times the transfer pipeline volume according to *Waste Transfer, Dilution, and Flushing Requirements*, TFC-ENG-STD-26 (WRPS 2019c). TOC can tailor the Tank Farm flushing standard to the specific activity and may be changed based on operational demands and lessons learned.

When the flush is completed, the WTP Contractor aligns valves to drain flush water to the Low Point Drain Vessel in the EMF. Draining the transfer line minimizes flush water pushed into a LAW CRV by the next treated LAW feed transfer.

### 2.2.3.4 Interface Maintenance and Operations

As part of inspections required to maintain the Hazardous Waste Permit for the TOC transfer lines, a pneumatic test of the encasement pipe is performed every 10 years at a minimum. The encasement line between Node 13 and the code break valve cannot be isolated during the performance of this test. The TOC plans to coordinate this pneumatic test to ensure the WTP portion of the encasement pipe is not pressurized without WTP knowledge and agreement.

The WTP Contractor operates and maintains the feed transfer line and leak detection system from interface Node 13 on the *Interface Control Drawing* (BNI 2019k) to the WTP Contractor's LAW CRVs. The TOC operates and maintains the feed transfer line from the AP Tank Farm to interface Node 13 and the leak detection system at the AP Tank Farm.

The WTP Contractor operates and maintains the control system signal lines from interface Node 18 on the *Interface Control Drawing* (BNI 2019k) to the WTP Contractor’s control room. The TOC operates and maintains the control system signal lines from the Tank Farm control room to interface Node 18.

The *LAW Concentrate Receipt Process System Operating Manual*, 24590-LAW-LCP-SOM-0001 (WTCC 2020) has been set up to provide operating instructions for the equipment in the LAW concentrate receipt process (LCP) system. Sections of this manual for feed transfer are only a preliminary issue and have not been updated to include current configurations.

### 2.2.4 Interface Milestones

Refer to the DFLAW Integrated Schedule for monitoring appropriate interface schedule milestones.

**Table 3 DFLAW Feed Interface Milestones**

| Contractor | Activity ID    | Activity Name  |
|------------|----------------|--|
| WTP        | 5HLC3WA10481   | LAW – Ops - Complete DOE HQ Operational Readiness Review Closure |
| TOC        | Y326-TEMP-0229 | LAW Feed Commission – Turnover to Operations                     |
| TOC        | Y326-2201-1400 | TSCR DOE Issue Authorization to Start Letter – TSCR Operations   |
| TOC        | Y326-TEMP-339  | (TSCR) Complete and Submit CD-4 Package                          |
| TOC        | Y326-TEMP-559  | (TSCR) CD-4 DOE Approval – ORP Transmit Approval                 |
| TOC        | IO40           | AP-106 Grab Sample and Verification                              |

### 2.3 Acceptance Criteria

To ensure adherence to applicable safety, permitting, and technical bases of the TOC and the WTP LAW Facility, *Integrated Direct Feed Low-Activity Waste Feed Qualification Program Description*, 24590-WTP-PD-RAEN-EN-0008 (RPP-RPT-59314) (BNI 2021e), was jointly developed by the TOC and the WTP Contractor. The program includes a protocol for sampling and analyzing supernatant from the Staging and Characterization DST (AP-105) and a systematic method for bench-scale testing to demonstrate processability. The integrated approach supports single laboratory analysis of qualification samples for both TSCR and LAW Facility waste acceptance criteria. It uses the same qualification samples for the bench-scale tests. Data from the qualification results can also be used to forecast characteristics of secondary waste streams. The program includes a package of report data for documentation of the campaign qualification.

Table 4 and Table 5 define the set of constituents and properties requiring quantification during the feed campaign qualification process. The data collection requirements for treated LAW feed are documented in the DFLAW DQO (BNI 2020p).

Table 4 provides a listing of constituents needed to complete characterization of the treated LAW feed (see Open Item 0005 in Appendix A). The constituents include those that are not listed in Table 5. The

data for the constituents in Table 4 are required for reporting, glass formulation, and (or) processability purposes. Therefore, the values stated for the constituents represented in Table 4 are not actionable limits and are separate from the LAW Facility waste acceptance criteria as used in this ICD. However, the determination and reporting of the values for the constituents in Table 4 follows the same quality assurance and quality control process as the determination of the values in Table 5 as described in the DFLAW DQO (BNI 2020p).

**Table 4 DFLAW Feed Constituents for Reporting Purposes**

| Constituents  | Notes | Reference  |
|---|-------|--|
| Specification 7, Table TS-7.1 list of constituents and concentrations                   | 1, 2  | WTP Contract (DOE 2000)  |
| Analytes for immobilized LAW glass formulation from sample point LAW 1a                 | 2, 3  | <i>Constituents Important to ILAW Glass Formulation and Product Compliance Reporting</i> (BNI 2020o) |
| RCRA metals from Table 3C-6 of the DWP Waste Analysis Plan for DFLAW                    |       | Hanford DWP (WA7890008967), Part III, Operating Group 10, Chapter 3C                                 |
| Additional species for EMF effluent waste compatibility analysis: Bi, Co, Mn, Rh, Sr, W | 4     | <i>Data Quality Objectives for Tank Farms Waste Compatibility Analysis (WRPS 2018d)</i>              |
| Oxalate concentration for melter feed rate calculation                                  |       | <i>Full Feed Rate of Dangerous Waste to LAW Melters for the DFLAW Mission (BNI 2017h)</i>            |

**Notes:**

1. Table TS-7.1 in the WTP Contract (DOE 2000) list chemical components for LAW. The concentrations apply to the soluble fraction only. The radionuclides listed in Table TS-7.2 are all included in Table 5.
2. Some of these analytes are listed in Table 5. The remaining analytes listed in the reference are not needed for qualification.
3. The analytes for this sample not listed in Table 5 are needed to calculate the initial glass formulation (see Section 3.3.2.4), which also determines the target volume of a treated LAW feed batch transfer.
4. Data from calculations, models, or process knowledge may be used if analytical data is not available or practical.

Table 5 contains the subset of constituents and properties that are the treated LAW feed acceptance criteria. Specification 7, Section 7.1 of the WTP Contract (DOE 2000) states that Envelope E requirements are described in ICD 30. Table 5 provides the compositional limits for Envelope E. Table 5 provides the basis for acceptance of treated LAW feed.

**Table 5 Treated LAW Feed Acceptance Criteria**

| Property                                    | Limit  | Notes   | Reference (Note 17)               |
|---|--|---------|-----------------------------------|
| <b>Stream Properties</b>                    |  |         |                                   |
| Feed pH                                     | $\geq 12$  | 1       | DOE 2015 (BNI 2019g)              |
| WTP feed receipt temperature                | $< 140$ °F   | N/A     | DOE 2015 (BNI 2010c)              |
| Feed viscosity                              | $\leq 15$ cP   | 2       | DOE 2015 (BNI 2017d)              |
| Suspended solids concentration              | $\leq 3.4$ wt%   | 3, 4, 5 | DOE 2015 (BNI 2010d)              |
| Feed bulk density                           | $< 1.35$ kg/L  | 6       | DOE 2015 (WRPS 2019c)             |
| Hydrogen generation rate                    | $\leq 8.5E-07$ g-mol H <sub>2</sub> /L/hr @140 °F                                      | N/A     | DOE 2015 (BNI 2010c)              |
| Waste compatibility                         | $< \pm 20$ °C  | 7       | DOE 2015 (WA7890008967)           |
| Liquid fraction unit dose                   | $< 1030$ Sv/L  | N/A     | DOE 2015 (BNI 2014a)              |
| Separable organics                          | No visual immiscible layer   | 8       | DOE 2015 (DOE 2013)               |
| Unit Sum of Fractions (USOF)                | $\leq 1.05E+09$ for USOF-1<br>$\leq 1.09E+08$ for USOF-2<br>$\leq 7.99E+06$ for USOF-3 | N/A     | BNI 2021f<br>BNI 2021g            |
| <b>Chemical Components</b>                  |  |         |                                   |
| Sodium concentration                        | $\geq 5$ M and $\leq 7$ M  | 9       | DOE 2015 (BNI 2014b)<br>BNI 2020i |
| Chloride (Cl) ratio                         | $< 3.7E-02$ mol/mol sodium   | 18      | DOE 2015<br>(DOE 2000 Envelope A) |
| Fluoride (F) ratio                          | $< 9.1E-02$ mol/mol sodium   | 18      | DOE 2015<br>(DOE 2000 Envelope A) |
| Sulfate (SO <sub>4</sub> ) ratio            | $< 7.0E-02$ mol/mol sodium   | 10      | DOE 2015<br>(DOE 2000 Envelope A) |
| Mercury (Hg) ratio                          | $< 1.4E-05$ mol/mol sodium   | 11      | DOE 2015 (DOE 2000)               |
| Total organic carbon concentration          | $< 10$ wt%   | N/A     | DOE 2015 (WA7890008967)           |
| Ammonia (NH <sub>3</sub> ) concentration    | $< 0.04$ M   | N/A     | DOE 2015 (BNI 2006)               |
| PCB concentration                           | $< 50$ ppm   | N/A     | DOE 2015 (WA7890008967)           |
| Molar ratio of (nitrate + nitrite) / sodium | $\leq 0.8$   | N/A     | BNI 2021f<br>BNI 2021g            |
| <b>Radionuclides</b>                        |  |         |                                   |
| Cesium-137 ratio                            | $< 3.18E-05$ Ci/mol sodium   | 12      | DOE 2015 (BNI 2014b)              |
| Europium-154 concentration                  | $< 1.8E-05$ Ci/L   | 5       | BNI 2012b                         |
| Cobalt-60 concentration                     | $< 1.1E-06$ Ci/L   | 5       | BNI 2012b                         |
| Strontium-90 ratio                          | $< 1.19E-03$ Ci/mol sodium   | 13      | DOE 2015 (DOE 2000)               |
| Technetium-99 concentration                 | $< 4.8E-04$ Ci/L   | 14      | DOE 2015 (BNI 2014a)              |
| Plutonium-239 concentration                 | $< 3.0E-05$ Ci/L   | N/A     | DOE 2015 (BNI 2014a)              |
| Uranium-233 concentration                   | $< 1.6E-07$ Ci/L   | N/A     | DOE 2015 (BNI 2014a)              |

| Property                  | Limit                    | Notes | Reference (Note 17)  |
|---------------------------|--------------------------|-------|----------------------|
| Uranium-235 concentration | < 1.7E-09 Ci/L           | N/A   | DOE 2015 (BNI 2014a) |
| Transuranics ratio        | < 1.30E-05 Ci/mol sodium | 15    | DOE 2015 (DOE 2000)  |
| U fissile to U total      | < 0.96 wt%               | 5, 16 | DOE 2015 (BNI 2021h) |

**Notes:**

- 1 Limit from the DWP (WA7890008967) DFLAW Waste Analysis Plan is >12.
- 2 Analysis is made on the bulk sample after holding the bulk sample at 25 °C for 8 hours. Property is measured at 25 °C. DFLAW feed value is for a Newtonian fluid.
- 3 Solids to be measured after holding the bulk sample at 25 °C for 8 hours. Definition of suspended solids concentration is provided in Appendix B.
- 4 The TOC filtration system is expected to remove most suspended solids.
- 5 Concentration value was modified during development of Revision 0 of this ICD.
- 6 Concentration value represents upper limit of “supernatant” as defined in *Waste Transfer, Dilution, and Flushing Requirements*, TFC-ENG-STD-26 (WRPS 2019c). This limit reduces the risk of solution near solubility limits with potential for precipitation.
- 7 Compatibility is determined per ASTM Method D5058-90 using 10 mL samples. ASTM D5058 provides standard test practices to screen wastes for potentially hazardous reactions. If, after mixing samples, no reactions are observed and no temperature change outside the specified range is observed, then the waste passes the compatibility test.
- 8 The proposed deminimus concentration level for separable organics that could be sent to the WTP without adversely affecting the WTP has been accepted by the DOE (*Acceptance of Contract Deliverable 2.11, Proposed Deminimus Organic Concentration in Received Tank Waste*, CCN 265033 [DOE 2013]).
- 9 For cesium removal by ion exchange, the expected operating range of sodium concentration is 5 M to 6 M, CCN 268879 (BNI2014b). The lower sodium limit was established to support LAW melter throughput. The upper limit of 7M was changed in revision 1 based on a recommendation from a hazard categorization evaluation by WTP Nuclear Safety (BNI 2020i).
- 10 Sulfate in the feed is limited, as preliminary model results show that sulfur content has the most impact on reduced waste loading in glass.
- 11 Value is applied to ensure that WTP air permit emission limits are met.
- 12 Value is estimated based on 6 M sodium LAW feed and 20 wt% Na<sub>2</sub>O in the glass at 0.3 Ci/m<sup>3</sup> glass loading. The limit of 0.3 Ci/m<sup>3</sup> in the ILAW product and called out in Section C.7 (d) (1) (iii) of the WTP Contract (DOE 2000) was developed to support the maintenance concept for the LAW Facility and continues to apply to DFLAW operation.
- 13 Limited to maximum glass loading of 20 Ci/m<sup>3</sup>.
- 14 Limited to maximum glass loading of 3 Ci/m<sup>3</sup>. The Tc-99 limit shown is based on inhalation dose.
- 15 Limited to maximum glass loading of 100 nCi/g
- 16 The total uranium mass, “U total”, is the sum of the U-233, U-235 and U-238 masses, and the “U fissile” mass is the sum of U-235 + 1.4 x U-233.
- 17 Unless applicability to Note 5 is given, references in parenthesis are the source of values stated in *Transmittal of the Revised Design Inputs for the Direct Feed Low-Activity Waste Initiative*, CCN 277593 (DOE 2015).
- 18 Halide capture in LAW glass is limited; excess halides increase the corrosivity of the melter offgas.

### 2.3.1 DFLAW Feed Qualification

According to the *Integrated DFLAW Feed Qualification Program Description* (BNI 2021e), the DFLAW feed qualification process consists of four steps:

1. Obtain the qualification sample



2. Analyze the qualification sample
3. Test unit operations
4. Report data

DFLAW feed campaign samples are collected by the TOC from the appropriate DST. Prior to collecting samples, the TOC is responsible to prepare a Tank Sampling and Analysis Plan and a sampling work package. Samples are then collected in accordance with the DFLAW DQO (BNI 2020p) and delivered to the qualification laboratory for processing. Once the samples are collected, the DST is placed in a configurational “hold” until the campaign is accepted by both the TOC and the WTP Contractor. No transfers or additions other than water are performed during this “hold”.

The initial feed campaign for DFLAW (the “first feed” campaign), which will provide feed for WTP hot commissioning, has already been staged in AP-107. Subsequent campaigns will be prepared in the Staging and Characterization Tank (AP-105). Future campaigns may use other available DSTs for staging and characterization.

DFLAW qualification samples are processed and analyzed in accordance with the DFLAW DQO (BNI 2020p). Per *One System Decision Document 0007*, CCN 282252 (BNI 2016b), the 222-S Laboratory has been identified as the qualification laboratory during DFLAW commissioning and operations. The sample analysis and testing include the following elements:

- Perform analysis to evaluate the TSCR waste acceptance criteria
- Perform analysis to evaluate the LAW Facility acceptance criteria
- Perform analysis to provide additional data for reporting
- Conduct bench scale unit operations tests for TSCR
- Prepare and analyze an equivalent melter feed slurry using the WTP glass algorithm
- Vitrify the melter feed slurry to produce a glass coupon
- Analyze the vitrified glass

Analytical results are delivered to the TOC and the WTP Contractor electronically to evaluate acceptance of the DFLAW feed campaign.

The final step is to provide a qualification data package. The package documents the basis for accepting the feed campaign, provides data for evaluation for safety basis compliance, and identifies potential operating difficulties. The package documents the data for waste acceptance criteria compliance, results from the bench-scale unit operations, additional data for WTP reporting, and secondary waste forecasts.

### 2.3.2 Treated LAW Feed Data

Some of the criteria in the LAW Facility waste acceptance criteria cannot be evaluated based on the DST feed campaign qualification data. Section 3.3.2.7 establishes a requirement for the TOC to provide data to meet these criteria. The *Integrated DFLAW Feed Qualification Program Description* (BNI 2021e) includes concepts for verifying each of these criteria has been met:

- Weight percent suspended solids
- Cesium-137 ratio to sodium
- Feed temperature

### 2.3.3 DFLAW Feed Campaign Acceptance

The TOC provides qualification data and results to the WTP Contractor prior to the transfer of a new campaign to the DFLAW Feed Tank (AP-107). The initial estimate of time for qualification, including bench-scale processability testing, was 14 days for sampling and 98 days for analysis.

If the TOC and the WTP Contractor accept the DFLAW feed campaign, the “hold” is removed from the staged DST. For the “first feed” campaign, the contents of AP-107 can begin processing through TSCR. For subsequent campaigns that use AP-105 for staging, the contents of AP-105 can be transferred to AP-107 as feed for TSCR.

If the results from qualification are not accepted, additional actions such as re-analysis of samples or re-sampling of staged feed, may be needed. Specific actions are to be implemented on a case-by-case basis as described by the DFLAW DQO (BNI 2020p) decision rules (see Section 3.0).

## 3 Requirements

This section identifies all Technical (Design Criteria), Activity Level, and Programmatic requirements associated with the interfaces defined by the ICD. Specific requirements for implementation by the appropriate contractors are listed in this section only. In addition to the requirement statement, each requirement includes a basis for that requirement, the requirement source document(s), and the implementing document(s) (if known at the time of revision). Source and implementing documents are listed as configuration management items for each requirement.

### 3.1 Technical Requirements (Design Criteria)

Technical requirements are requirements managed by engineering organizations according to engineering procedures and work processes.

#### 3.1.1 WTP Contractor Technical Requirements

For the WTP Contractor, technical requirements are managed in accordance with *Technical Requirements Management*, 24590-WTP-3DP-G04B-00004 (BNI 2019q). Any changes to the requirements in this subsection are reviewed with the WTP Manager of Engineering.

- 3.1.1.1 Underground treated LAW feed transfer piping from the Node 13 interface point to the LAW Facility shall be a double-contained feed transfer pipeline. The core (inner) pipe shall be 3-inch nominal diameter, schedule 40S, ASTM A 312 grade TP 316L, seamless construction. The encasement (outer) pipe shall be 6-inch nominal diameter, standard wall thickness, ASTM A 106 grade B, seamless construction.

**Requirement Basis:** The treated feed transfer line should match the existing transfer lines from the Pretreatment Facility to the LAW Facility to minimize impacts to the existing LAW Facility piping.

The interface point (Node 13) was determined by mutual agreement between WTP Engineering and TOC Engineering during DFLAW conceptual design. This interface point is located near the WTP site boundary and is designated as Node 13 as shown on the *Interface Control Drawing* (BNI 2019k). TOC is responsible for providing the transfer line on the TOC-side of the interface point, and WTP is responsible for providing the transfer line on the WTP-side of the interface point.

**Configuration Management Document(s):**

Requirement Source(s):

- *P&ID – LAW Concentrate Receipt Process System LCP-BULGE-00001*, 24590-LAW-M6-LCP-00001001 (BNI 2020e)
- *Engineering Specification for Piping Class S32B*, 24590-WTP-3PB-P000-TS32B (BNI 2018f)

Implementation:

- *P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*, 24590-BOF-M6-RLD-00012001 (BNI 2019r)
- *P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*, 24590-BOF-M6-RLD-00012002 (BNI 2019s)

- *P&ID – BOF/EMF Direct Feed LAW EMF Process System Underground Transfer Lines*, 24590-BOF-M6-DEP-00010001 (BNI 2020q)
- *DEP-PB-00009-S32B-3 - Balance of Facilities Isometric*, 24590-BOF-P3-DEP-PB00009001 (BNI 2016a)
- *DEP-PB-00009-S32B-6 - Balance of Facilities Isometric*, 24590-BOF-P3-DEP-PB00009051 (BNI 2016p)

3.1.1.2 The WTP Contractor shall provide an ASME B31.3 code break valve at a location determined by the WTP Contractor to allow a 400 psig design pressure on the upstream side of the valve, and a 150 psig design pressure on the downstream side of the valve

**Requirement Basis:** TOC piping will have a design pressure of 400 psig and WTP LAW piping will have a design pressure of 150 psig. *One System Decision Document 0018* (BNI 2018d) was developed to address this difference. TOC evaluated the steady-state dead head pressure of the system within the WTP LAW Facility in RPP-CALC-62103 (WRPS 2018c). Based on the allowable operating system flow rates (60 - 88 gpm, supporting 30 metric tons of glass/day LAW throughput) for the transfer system, the system steady-state dead head pressure can be accommodated by 150 psig WTP design pressure. As such, *One System Decision Document 0018* (BNI 2018d) recommended a code break valve that would allow the Tank Farms side of the break to be designed and rated to 400 psig and would allow the WTP system to remain at 150 psig on the LAW Facility side of the valve.

**Configuration Management Document(s):**

Requirement Source(s):

- *18-WSC-0050, One System Decision Document 0018, Transfer Line Pressure Discrepancy Resolution*, CCN 307994 (BNI 2018d).
- *Transmittal of Contract Modification No. 432, Change Order for Actuated On/Off Valve and Notice to Proceed*, CCN 309012 (BNI 2018e).
- *Design Pressure and Temperature Calculation for the EMF DEP/DVP/AFR/NLD/SHR/SNR Systems*, 24590-BOF-M6C-DEP-00009 (BNI 2020d)
- *Design Pressure and Design Temperature Calculation for LCP System*, 24590-LAW-MEC-LCP-00002 (BNI 2016e)

Implementation:

- *P&ID – BOF/EMF Direct Feed LAW EMF Process System Underground Transfer Lines*, 24590-BOF-M6-DEP-00010001 (BNI 2020q)
- *Instrument Data Sheet, Actuated On/Off Valve FF*, 24590-BOF-JVD-DEP-86870 (BNI 2018h)
- *Pressure, Temperature, and Pipe Size for Transferring Treated LAW Feed from the ICD 30 Interface Point to the EMF and LAW Facility for DFLAW Operations*, 24590-BOF-M6C-LCP-00001 (BNI 2019c).

3.1.1.3 The WTP Contractor shall ensure:

- 1) All core (inner) pipe components installed in the treated LAW feed transfer system on the downstream (LAW Facility) side of the ASME B31.3 code break valve shall meet or exceed a design pressure/temperature of 150 psig at 150 °F.

- 2) All core (inner) pipe components installed in the treated LAW feed transfer system between the ASME B31.3 code break valve and the Node 13 interface point shall meet or exceed a design pressure/temperature of 400 psig at 150 °F.
- 3) All encasement (outer) pipe components installed in the treated LAW feed transfer system shall meet or exceed a design pressure/temperature of 50 psig at 150 °F.

**Requirement Basis:** The treated LAW feed transfer system will include existing pipelines and valves in the LAW Facility, which have an established design pressure of 150 psig at a design temperature of 150 °F. *One System Decision Document 0018* (BNI 2018d) recommended a code break valve that allows the Tank Farms side of the valve to be designed and rated to 400 psig, and the WTP system to remain at 150 psig on the LAW Facility side of the valve.

**Configuration Management Document(s):**

Requirement Source(s):

- *Design Pressure and Design Temperature Calculation for LCP System*, 24590-LAW-MEC-LCP-00002 (BNI 2016e)
- *18-WSC-0050, One System Decision Document 0018, Transfer Line Pressure Discrepancy Resolution*, CCN 307994 (BNI 2018d)
- *Transmittal of Contract Modification No. 432, Change Order for Actuated On/Off Valve and Notice to Proceed*, CCN 309012 (BNI 2018e)
- *AP Farm to Waste Treatment Plant Low Activity Waste Facility Hydraulic Transient Analysis*, RPP-CALC-62531 (WRPS 2020c)

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Engineering Requirement Area Manager (RAM) as identified in 24590-WTP-LIST-RARM-RM-0001, *Designation of Requirement Area Managers and Subject Matter Experts* (BNI 2019b).

- 3.1.1.4 The WTP Contractor shall provide corrosion protection measures on the WTP underground portion of the treated LAW feed outer containment pipe consisting of an epoxy coating followed by a rigid foam insulation protected by a waterproof nonmetallic jacket.

**Requirement Basis:** As described in CCN 258399 (BNI 2013b), a corrosion protection strategy of using multiple barriers and protective coatings to isolate the carbon steel outer pipe from the soil to maintain dry non-corroding conditions has been endorsed by a corrosion expert and the Independent Qualified Registered Professional Engineer to meet WAC 173-303-640. The Department of Ecology has agreed with this rationale for corrosion protection from the soil environment per CCN 191104 (BNI 2013a).

**Configuration Management Document(s):**

Requirement Source(s):

- Washington Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*
- *Thermally Insulated and High-Density Polyethylene Jacketed Waste Transfer Line NACE SP0169-2013 Evaluation*, 24590-WTP-RPT-ENG-16-015 (BNI 2016d)
- *Corrosion Assessment of UG Waste Transfer Lines*, CCN 191104 (BNI 2013a)
- *Response to ORP Question on Cathodic Protection of Tank Farm Transfer Piping*, CCN 258399 (BNI 2013b)

Implementation:

- *P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*, 24590-BOF-M6-RLD-00012001 (BNI 2019r)
- *P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*, 24590-BOF-M6-RLD-00012002 (BNI 2019s)
- *DFLAW Rad Transfer Lines Miscellaneous Details Sheet 3*, 24590-BOF-CS-80-00152, (BNI 2020n)

- 3.1.1.5 The WTP Contractor shall ensure all underground treated LAW feed transfer piping is buried a minimum of 3 feet deep to the top of the core (inner) pipe.

**Requirement Basis:** *Tank Farms Technical Safety Requirements*, HNF-SD-WM-TSR-006 (WRPS 2018a), Specific Administrative Control 5.8.8, *Waste Transfer System Freeze Protection* requires air temperature monitoring for physically connected buried/bermed waste transfer piping. Except for buried/bermed waste transfer primary piping where a documented evaluation demonstrates there is no freezing hazard, air temperature monitoring is required in the primary piping encasements to ensure the temperature is  $> 32$  °F. Per the *Tank Farm Operations Administrative Controls*, HNF-IP-1266 (WRPS 2018b), there are two exceptions where physically connected buried/bermed waste transfer primary piping does not require freeze protection. One of these exceptions is for waste transfer primary piping that is covered by an equivalent of  $\geq 3$  feet of soil to the top of the pipe. This freeze protection requirement applies to all physically connected buried/bermed piping in the transfer system, which would include transfer piping installed by the WTP Contractor. The TOC requirement for  $\geq 3$  feet of cover for waste transfer lines is consistent with the same WTP requirement in the WTP *Basis of Design*, Section 10.1.5.7 (BNI 2019f).

**Configuration Management Document(s):**

Requirement Source(s):

- *Basis of Design*, 24590-WTP-DB-ENG-01-001 (BNI 2019f)
- *Tank Farms Technical Safety Requirements*, HNF-SD-WM-TSR-006 (WRPS 2018a)
- *Tank Farm Operations Administrative Controls – Waste Transfer System Freeze Protection*, HNF-IP-1266, Section 5.8.8 (WRPS 2018b)

Implementation:

- *DFLAW Rad Transfer Lines Overall Key Plan*, 24590-BOF-CS-80-00120, Note 4 (BNI 2016g)
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAWPS Building Plan EPS1 and EPS2 – Profile EPS1 STA 9+00 to 10+11.3*, 24590-BOF-CS-80-00131 (BNI 2016h)
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAWPS Building Plan EPS1 and EPS2 – Profile EPS1 STA 6+00 To 9+00*, 24590-BOF-CS-80-00132 (BNI 2016i)
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAWPS Building Plan EPS1 and EPS2 – Profile EPS1 STA 3+00 To 6+00*, 24590-BOF-CS-80-00133 (BNI 2016j)

- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAWPS Building Plan EPS1 and EPS2 – Profile EPS1 STA 0+00 To 3+00, 24590-BOF-CS-80-00134 (BNI 2016k)*
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAW Vitrification / Lab Bldgs, Plan ELW1, ELW2, ELW3 and ELB1 – Profile ELW1 STA 0+00 To 3+00, 24590-BOF-CS-80-00121 (BNI 2016l)*
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAW Vitrification / Lab Bldgs, Plan ELW1, ELW2, ELW3 and ELB1 – Profile ELW1 STA 3+00 To 6+00, 24590-BOF-CS-80-00122 (BNI 2016m)*
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAW Vitrification / Lab Bldgs, Plan ELW1, ELW2, ELW3 and ELB1 – Profile ELW1 STA 6+00 To 9+00, 24590-BOF-CS-80-00123 (BNI 2016n)*
- *DFLAW Rad Transfer Lines LAW Effluent Drain Tank Bldg to LAW Vitrification / Lab Bldgs, Plan ELW1, ELW2, ELW3 and ELB1 – Profile ELW1 STA 9+00 To 10+88.47, 24590-BOF-CS-80-00124 (BNI 2016o)*

3.1.1.6 The WTP Contractor shall provide/transmit treated LAW feed transfer data (e.g., flow rates, density, temperature, pressure, radiation level, valve alignment, etc.) to incorporate into the Tank Farms Monitoring and Control System.

**Requirement Basis:** The TOC and the WTP direct-feed LAW effluent management facility process (DEP) system provide monitoring information for their respective transfer lines and feed tank/feed receipt systems to incorporate into the Tank Farms Monitoring and Control System and the WTP control network. This data link allows Tank Farms to see WTP transfer data while operating and during transfer.

**Configuration Management Document(s):**

Requirement Source(s):

- WTP Contract, Section C.7(a)(3) (DOE 2000)
- *Operations Requirements Document, 24590-WTP-RPT-OP-01-001, Section 7.1 (BNI 2019h)*
- *Recommended Approach to Control System Interfaces for ICD-05, ICD-06, ICD-30, and ICD-31, RPP-RPT-61745 (WRPS 2020a)*

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Engineering RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts (BNI 2019b)*.

3.1.1.7 The WTP Contractor shall provide fiber optic cable and telecommunications equipment for transmitting/receiving process monitoring data, handshake signals (e.g., Ready to Transfer, Ready to Receive, Transfer in Progress, Terminate Transfer, etc.) and communications watchdog signals associated with the transport of treated LAW feed between the Node 18 telecommunications interface point and WTP facilities using Process Field Bus (PROFIBUS) communication technology.

**Requirement Basis:** Shared contractor control and monitoring signals associated with the transport of treated LAW feed will be transmitted between WTP and TOC. Signal transmission from the WTP to the Node 18 telecommunications interface point is WTP

Contractor responsibility. Signal transmission from the Node 18 telecommunications interface point to AP Tank Farm is TOC responsibility. The Node 18 telecommunications interface point is shown on the *Interface Control Drawing* (BNI 2019k) near Pole E2476 in junction box 6FX2 (provided by others). Per the *WTP Basis of Design* (BNI 2019f), PROFIBUS is a preferred communications protocol.

**Configuration Management Document(s):**

Requirement Source(s):

- *Basis of Design*, 24590-WTP-DB-ENG-01-001 (BNI 2019f)
- *Interface Control Document (ICD) 30 – Low-Activity Waste Pretreatment System (LAWPS) Technical Opportunities*, CCN 278737 (BNI 2015b)
- *Interface Control Drawing*, 24590-WTP-B2-C12T-00001 (BNI 2019k)

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Engineering RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts* (BNI 2019b).

- 3.1.1.8 WTP shall provide permissive and shutdown signals (e.g., interlock) to the Tank Farm Monitoring and Control System to shutdown transfer of treated LAW feed and establish a fail-safe state if an upset condition is detected (e.g., leak detection, high radiation, high flow rate, high tank levels, valve alignment).

**Requirement Basis:** During the transfer process, if an upset condition is detected, initiation of an interlock or removal of a permissive to TOC will occur and result in the immediate stop of the transfer, thus halting the in-progress transfer and establishing a fail-safe condition.

**Configuration Management Document(s):**

Requirement Source(s):

- *Operations Requirements Document*, 24590-WTP-RPT-OP-01-001, Section 7.1 (BNI 2019h)
- *Recommended Approach to Control System Interfaces for ICD-05, ICD-06, ICD-30, and ICD-31*, RPP-RPT-61745 (WRPS 2020a)

Implementation:

- *P&ID – BOF/EMF Direct Feed LAW EMF Process System Effluent Facility Leak Detection DEP-LDB-00001 Thru DEP-LDB-00008*, 24590-BOF-M6-DEP-00011001 (BNI 2021d)
- *P&ID – BOF/EMF Direct Feed LAW EMF Process System Underground Transfer Lines*, 24590-BOF-M6-DEP-00010001 (BNI 2020q)
- *Logic Diagram - DFLAW DEP LAWPS/LCP Interface*, 24590-BOF-J3-DEP-70002 (BNI 2020g)
- *Functional Diagram DFLAW DEP Transfer Line Instrumentation*, 24590-BOF-J3-DEP-71001 (BNI 2020h)

- 3.1.1.9 The WTP Contractor shall provide capability/instrumentation to measure the total volume of treated LAW feed during transfers to the LAW Facility.



**Requirement Basis:** Instrumentation is needed to determine volume received in WTP process vessels during the transfer. This volume data will be used to determine when to stop the transfer and may be used for volume balances with the TOC.

**Configuration Management Document(s):**

Requirement Source(s):

- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)*
- *Operations Requirements Document, 24590-WTP-RPT-OP-01-001, Section 7.1 (BNI 2019h)*

Implementation:

- *P&ID – BOF/EMF Direct Feed LAW EMF Process System Underground Transfer Lines, 24590-BOF-M6-DEP-00010001 (BNI 2020q)*
- *P&ID – LAW Concentrate Receipt Process System Concentrate Receipt Vessel LCP-VSL-00001, 24590-LAW-M6-LCP-00001003 (BNI 2021a)*
- *P&ID – LAW Concentrate Receipt Process System Concentrate Receipt Vessel LCP-VSL-00002, 24590-LAW-M6-LCP-00002004, (BNI 2021b)*

- 3.1.1.10 The design of the DEP system feed transfer piping to the LAW Facility shall include a radiation monitor. The batch transfer of treated LAW feed shall be stopped upon detection of radiation levels that exceed the limits for the LAW Facility.

**Requirement Basis:** Use of a radiation monitor within the transfer line allows the transfer of treated feed to be monitored and stopped if the measured levels exceed limits for the LAW Facility.

**Configuration Management Document(s):**

Requirement Source(s):

- *Interface Control Document Review Team (ICDRT) ICD 30 Meeting – April 29, 2015, CCN 277561 (BNI 2015c)*

Implementation:

- *P&ID – BOF/EMF Direct Feed LAW EMF Process System Underground Transfer Lines, 24590-BOF-M6-DEP-00010001 (BNI 2020q)*
- *Instrument Data Sheet - Liquid Radiation Monitor, 24590-BOF-JRD-DEP-86761 (BNI 2019d)*

- 3.1.1.11 The WTP control system shall ensure that the permissive to receive feed is removed before any WTP actuated valve affecting the transfer path is closed.

**Requirement Basis:** Ensuring WTP valve closures are delayed until after the permissive is removed will allow TOC to stop the transfer feed pump to mitigate water hammer potential. A joint WTP/TOC team formed to review control logic for interface transfers concurred with this recommendation.

### Configuration Management Document(s):

Requirement Source(s):

- *Direct Feed Low-Activity Waste (DFLAW) Controls Interface With WRPS*, CCN 305681, (BNI 2018j)
- *One System Integration Meeting – Instrumentation and Controls Interface Updates*, CCN 309711 (BNI 2018k)
- *AP Farm to Waste Treatment Plant Low Activity Waste Facility Hydraulic Transient Analysis*, RPP-CALC-62531 (WRPS 2020c)

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Engineering RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts* (BNI 2019b)

## 3.1.2 TOC Technical Requirements

- 3.1.2.1 Underground treated LAW feed transfer piping from the AP Tank Farm to the Node 13 interface point shall be a double-contained feed transfer pipeline. The core (inner) pipe up to the Node 13 interface point shall be compatible with 3-inch nominal diameter, schedule 40S, ASTM A 312 TP 316L, seamless construction. The containment (outer) pipe at the Node 13 interface point shall be compatible with 6-inch nominal diameter, standard wall thickness, ASTM A 106 grade B, seamless construction.

**Requirement Basis:** The feed transfer line should match the existing transfer lines from the Pretreatment Facility to the LAW Facility to minimize impacts to the existing LAW Facility piping.

The interface point (Node 13) was determined by mutual agreement between WTP Engineering and TOC Engineering during DFLAW conceptual design. This interface point is located near the WTP site boundary and is designated as Node 13 as shown on the *Interface Control Drawing* (BNI 2019k). The piping on the WTP side of the interface point is pipe class S32B per *Engineering Specification for Piping Class S32B* (BNI 2018f). TOC is responsible for providing the transfer line on the TOC-side of the interface point, and WTP is responsible for providing the transfer line on the WTP-side of the interface point.

### Configuration Management Document(s):

Requirement Source(s):

- *P&ID – BOF Radioactive Liquid Waste Disposal System Underground Transfer Lines*, 24590-BOF-M6-RLD-00012002 (BNI 2019s)
- *Engineering Specification for Piping Class S32B*, 24590-WTP-3PB-P000-TS32B (BNI 2018f)
- *Interface Control Drawing*, 24590-WTP-B2-C12T-00001 (BNI 2019k)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.2 The TOC shall ensure:

- 1) All core (inner) pipe components installed in the treated LAW feed transfer system between AP Tank Farm and the Node 13 interface point shall meet or exceed a design pressure/temperature of 400 psig at 150 °F.
- 2) All encasement (outer) pipe components installed in the treated LAW feed transfer system shall meet or exceed a design pressure/temperature of 50 psig at 150 °F.

**Requirement Basis:** Per TFC-ENG-STD-22 *Piping, Jumpers, and Valves* (WRPS 2017), new piping systems that will normally transport waste are designed for  $\geq 400$  psig and  $\geq 200$  °F for waste transfer systems that include metallic and non-metallic components. This design condition does not impact the WTP design. Additionally, *One System Decision Document 0018* (BNI 2018d) established a code break that allows the Tank Farms side of the code break to be designed and rated to 400 psig.

**Configuration Management Document(s):**

Requirement Source(s):

- 18-WSC-0050, *One System Decision Document 0018, Transfer Line Pressure Discrepancy Resolution*, CCN 307994 (BNI 2018d)
- AP Farm to WTP LAW Facility Design Pressure Evaluation, RPP-CALC-62103 (WRPS 2018c)
- TFC-ENG-STD-22, *Piping, Jumpers, and Valves* (WRPS 2017)
- AP Farm to Waste Treatment Plant Low Activity Waste Facility Hydraulic Transient Analysis, RPP-CALC-62531 (WRPS 2020c)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.3 The TOC shall provide corrosion protection measures on the TOC underground portion of the treated LAW feed outer containment pipe consisting of an epoxy coating followed by a rigid foam insulation protected by a waterproof nonmetallic jacket.

**Requirement Basis:** A corrosion protection strategy of using multiple barriers and protective coatings to isolate the carbon steel outer pipe from the soil to maintain dry non-corroding conditions has been endorsed by the Independent Qualified Registered Professional Engineer to meet WAC 173-303-640, as described in *Washington River Protection Solutions LLC Evaluation of Cathodic Protection for Waste Treatment and Immobilization Plant Waste Transfer Lines*, WRPS-1104067 (WRPS 2012).

**Configuration Management Document(s):**

Requirement Source(s):

- WAC 173-303, *Dangerous Waste Regulations*
- *Washington River Protection Solutions LLC Evaluation of Cathodic Protection for Waste Treatment and Immobilization Plant Waste Transfer Lines*, WRPS-1104067 (WRPS 2012)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.4 The TOC shall ensure all underground treated LAW feed transfer piping is buried an equivalent of 3 feet deep to the top of the core (inner) pipe.

**Requirement Basis:** *Tank Farms Technical Safety Requirements*, HNF-SD-WM-TSR-006 (WRPS 2018a), Specific Administrative Control 5.8.8, *Waste Transfer System Freeze Protection* requires air temperature monitoring for physically connected buried/bermed waste transfer piping. Except for buried/bermed waste transfer primary piping where a documented evaluation demonstrates there is no freezing hazard, air temperature monitoring is required in the primary piping encasements to ensure the temperature is > 32 °F. Per the *Tank Farm Operations Administrative Controls*, HNF-IP-1266 (WRPS 2018b), there are two exceptions where physically connected buried/bermed waste transfer primary piping does not require freeze protection. One of these exceptions is for waste transfer primary piping that is covered by an equivalent of  $\geq 3$  feet of soil to the top of the pipe. The TOC requirement for  $\geq 3$  feet of cover for waste transfer lines is consistent with the same WTP requirement for frost depth of waste transfer lines in the *WTP Basis of Design*, Section 10.1.5.7 (BNI 2019f).

**Configuration Management Document(s):**

Requirement Source(s):

- *Tank Farms Technical Safety Requirements*, HNF-SD-WM-TSR-006 (WRPS 2018a)
- *Tank Farm Operations Administrative Controls – Waste Transfer System Freeze Protection*, HNF-IP-1266 Section 5.8.8 (WRPS 2018b)
- *Basis of Design*, 24590-WTP-DB-ENG-01-001 (BNI 2019f)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.5 TOC shall ensure anti-siphoning measures are incorporated in the treated LAW feed transfer system from AP Tank Farm to WTP.

**Requirement Basis:** AP Tank Farm is at a higher elevation than the EMF Low-Point Drain Vessel, therefore mitigation of unplanned siphoning needs to be demonstrated.

**Configuration Management Document(s):**

Requirement Source(s):

- *Operations Requirements Document*, 24590-WTP-RPT-OP-01-001 Section 7.1 (BNI 2019h)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.6 The TOC filtration system shall provide equivalent performance to a sintered metal filter with a media grade of 5.

**Requirement Basis:** The original requirement for filtration based on performance of a Pretreatment Facility crossflow filter was found to be unnecessary. It was mutually agreed that the particle size requirement could be less restrictive. Typical supplier data indicated a filter with a media grade of 5 should remove 99% of 8-micron particles, which was determined acceptable.

**Configuration Management Document(s):**

Requirement Source(s):

- *Interface Control Document (ICD) 30, Revision 0 – Interface Control Form (ICF) 24590-WTP-ICF-MGT-17-0002 Strategy Meeting*, CCN 300509 (BNI 2017a)

- *Increase Nominal Particle Diameter for Filtration*, 24590-WTP-ICF-MGT-17-0002 (BNI 2017b)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.7 TOC shall not exceed the following constraints during treated LAW feed transfer to WTP:

- 1) The maximum transfer flow rate shall be 88 gallons/minute.
- 2) The maximum operating pressure shall be 136 psig downstream of the Node 13 interface point.

**Requirement Basis:** The design of the LAW Concentrate Receipt Vessels is based on a maximum inflow of 88 gpm per *LAW Concentrate Receipt Vessels LCP-VSL-00001/00002 Sizing*, 24590-LAW-M6C-LCP-00001 (BNI 2016f). For a design pressure of 150 psig with a 10% margin, the maximum operation pressure is determined to be 136 psig according to *Design Parameters and Test Pressures for Equipment and Piping*, 24590-WTP-3DG-M40T-00001 (BNI 2021c).

**Configuration Management Document(s):**

Requirement Source(s):

- *LAW Concentrate Receipt Vessels LCP-VSL-00001/00002 Sizing*, 24590-LAW-M6C-LCP-00001 (BNI 2016f)
- *Design Pressure and Design Temperature Calculation for LCP System*, 24590-LAW-MEC-LCP-00002 (BNI 2016e)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.8 The TOC shall provide fiber optic cable and telecommunications equipment for receiving monitoring data, handshake signals (e.g., Ready to Transfer, Ready to Receive, Transfer in Progress, Terminate Transfer, etc.) and communications watchdog signals associated with the transport of treated LAW feed between the Node 18 telecommunications interface point and AP Tank Farm using PROFIBUS communication technology.

**Requirement Basis:** Shared contractor control and monitoring signals associated with the transport of treated LAW Feed will be transmitted between WTP and TOC. Signal transmission from the WTP to the Node 18 telecommunications interface point is WTP Contractor responsibility. Signal transmission from the Node 18 telecommunications interface point to AP Tank Farm is TOC responsibility. The Node 18 telecommunications interface point is shown on the *Interface Control Drawing* (BNI 2019k) near Pole E2476 in junction box 6FX2. Per the *WTP Basis of Design* (BNI 2019f), PROFIBUS is a preferred communications protocol.

**Configuration Management Document(s):**

Requirement Source(s):

- *Basis of Design*, 24590-WTP-DB-ENG-01-001 (BNI 2019f)
- *Interface Control Document (ICD) 30 – Low-Activity Waste Pretreatment System (LAWPS) Technical Opportunities*, CCN 278737 (BNI 2015b)
- *Interface Control Drawing*, 24590-WTP-B2-C12T-00001 (BNI 2019k)

- *Recommended Approach to Control System Interfaces for ICD-05, ICD-06, ICD-30, and ICD-31*, RPP-RPT-61745 (WRPS 2020a)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.9 The TOC Tank Farm Monitoring and Control System shall stop a transfer and establish a fail-safe condition upon:

- a) detection of a leak by the TOC transfer line leak detection system, or
- b) removal of permissive signal by WTP, interlock, or loss of watchdog signals.

**Requirement Basis:** During the transfer process, a means of stopping treated LAW feed transfer flow in the event of an upset condition is detected in either the WTP transfer line or the TOC transfer line. Initiation of an interlock or other means resulting in the immediate stop of the transfer and establishing a fail-safe condition is required. Permissives may include leak detection and other process signals such as tank levels and valve alignment.

**Configuration Management Document(s):**

Requirement Source(s):

- *Operations Requirements Document*, 24590-WTP-RPT-OP-01-001 Section 7.1 (BNI 2019h)
- *Recommended Approach to Control System Interfaces for ICD-05, ICD-06, ICD-30, and ICD-31*, RPP-RPT-61745 (WRPS 2020a)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

3.1.2.10 TOC shall provide capability to measure the total volume of treated LAW feed during transfers to the LAW Facility.

**Requirement Basis:** Capability is needed to perform volume balances during transfers to WTP process vessels.

**Configuration Management Document(s):**

Requirement Source(s):

- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)
- *Operations Requirements Document*, 24590-WTP-RPT-OP-01-001 Section 7.1 (BNI 2019h)

Implementation:

- Implementing mechanisms for this requirement shall be established by the TOC.

## 3.2 Activity Level Requirements

Activity level requirements are facility and functional requirements that require incorporation into the work planning process. These include repetitive use requirements that are typically implemented in an operating technical procedure or preventative maintenance work package. They may also include task specific requirements that must be complied with when completing a specific scope of work, such as a

repair or replacement of a component. These are typically performed within a maintenance work control document.

### 3.2.1 WTP Contractor Activity Level Requirements

For the WTP Contractor, activity level requirements are managed in accordance with *Activity Level Flow Down of Requirements Applicable to Commissioning Phase Activities*, 24590-WTP-GPP-RAOP-OP-0003 (BNI 2019m).

No activity level requirements were identified for the WTP Contractor.

### 3.2.2 TOC Activity Level Requirements

No activity level requirements were identified for the TOC.

## 3.3 Programmatic Requirements

Programmatic requirements include those specified through the contract; federal, state, and local laws and regulations; DOE directives; and negotiated agreements such as memorandums of agreement, commitments and permits.

### 3.3.1 WTP Contractor Programmatic Requirements

For the WTP Contractor, programmatic requirements are managed per *Requirements Management*, 24590-WTP-GPP-RARM-RM-0001 (BNI 2019n).

- 3.3.1.1 If the qualification data for treated LAW feed, in combination with evidence of satisfactory TSCR performance, is compliant with the acceptance criteria specified in Table 5 of this ICD (consistent with the LAW TSR SAC for waste acceptance), the WTP Contractor will provide written notice to the TOC that the campaign is accepted.

**Requirement Basis:** Section 3C.5 of the WTP DWP (WA7890008967) provides steps to describe the WTP waste acceptance process for the DFLAW configuration. After the TOC provides a profile of a DFLAW waste feed campaign, the WTP Contractor reviews the profile to ensure compatibility and acceptability of the treated LAW feed. If the WTP Contractor finds that the campaign is acceptable, the WTP Contractor notifies the TOC that the treated LAW feed can be transferred. A written notice provides a record that this process has been followed.

The *Integrated DFLAW Feed Qualification Program Description* (BNI 2021e), Section 3.7 states that the results of feed qualification activities are documented to provide the basis for accepting the qualified waste feed into both the TSCR System and WTP LAW Facility.

The *Documented Safety Analysis for the Low-Activity Waste and Effluent Management Facilities* (BNI 2021f) established the Waste Acceptance Criteria SAC to limit the hazardous material inventory received at the LAW Facility or EMF to protect key safety analysis conclusions. This SAC protects multiple assumptions important to the hazard analysis, regarding the evaluated hazard categorization, and hazardous constituents forming the basis for hazards and consequence analyses. The SAC includes performance criteria to be verified prior to every batch transfer of treated LAW feed to the LAW Facility. The SAC is implemented through the LAW TSR (BNI 2021g).

**Configuration Management Document(s):**

Requirement Source(s):

- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)*
- *Integrated DFLAW Feed Qualification Program Description, 24590-WTP-PD-RAEN-EN-0008 (BNI 2021e)*
- *Documented Safety Analysis for the Low-Activity Waste and Effluent Management Facilities, 24590-LAW-DSA-NS 18-0001 (BNI 2021f)*
- *Low-Activity Waste and Effluent Management Facilities Technical Safety Requirements, 24590-LAW-TSR-NS-18-0001 (BNI 2021g)*

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Mission Integration RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts (BNI 2019b)*.

- 3.3.1.2 If a DFLAW feed campaign is outside the applicable acceptance criteria limits, the WTP Contractor and the TOC will prepare a joint assessment and recommend the preferred method(s), if possible and practical, to correct any feed composition or property deficiencies for DOE review and approval for subsequent WTP Contractor acceptance of treated LAW feed.

**Requirement Basis:** The *Integrated DFLAW Feed Qualification Data Quality Objectives (BNI 2020p)* defines five principal study questions for TOC to receive staged DFLAW feed in TSCR and provide the treated LAW feed to WTP. All five questions must have a “yes” answer to allow the transfer. If the answer to any one of the questions is “no”, the DFLAW DQO provides a set of alternative actions to be implemented. The combination of principal study questions and alternative actions provides the decision statement for the DQO process.

Section 3C.5 of the WTP DWP (WA7890008967) provides a similar set of alternatives in the event that one or more of the acceptance criteria are not met.

**Configuration Management Document(s):**

Requirement Source(s):

- *Integrated DFLAW Feed Qualification Data Quality Objectives, 24590-LAW-RPT-PENG-16-003 (BNI 2020p)*.
- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)*

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Mission Integration RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts (BNI 2019b)*.



3.3.1.3 After treated LAW feed is received into WTP, the WTP Contractor will perform volume transfer and receipt comparison measurements with the TOC to ensure that the volume of waste feed transferred is the volume of waste feed that was received.

**Requirement Basis:** Section 3C.5 of the WTP DWP (WA7890008967) provides steps to describe the WTP waste acceptance process. The final step in the process describes that the TOC and WTP compare volume transfer measurements. Completion of this step indicates that none of the DFLAW treated feed was leaked or mis-transferred during the batch transfer from Tank Farms to WTP.

**Configuration Management Document(s):**

Requirement Source(s):

- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)*

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Mission Integration RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts (BNI 2019b)*.

3.3.1.4 The WTP Contractor will notify the TOC of the following:

- Any operations interruptions of more than 14 days that could impact delivery of treated LAW feed batches.
- Any maintenance activities that require coordination of lockout/tagout across the interface.
- Changes in the feed receipt system configuration, including valve closure times.

**Requirement Basis:** Notification of significant WTP shutdowns allows TOC to coordinate activities that could interrupt processing of DFLAW feed. Advance notice, if possible, could provide time for TOC to plan such activities. The duration for interruption of operations is based on the Tank Farms standard *Waste Transfer, Dilution, and Flushing Requirements (WRPS 2019c)*, which requires a transfer line to be flushed if there are no transfers within 14 days.

**Configuration Management Document(s):**

Requirement Source(s):

- *ICD 24590-WTP-ICD-MG-01-030, Rev 1, Programmatic Requirements Meeting (Concepts B: Batch Transfer Process), CCN 314460 (BNI 2019o)*
- *AP Farm to Waste Treatment Plant Low Activity Waste Facility Hydraulic Transient Analysis, RPP-CALC-62531 (WRPS 2020c)*

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Mission Integration RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts (BNI 2019b)*.

3.3.1.5 The WTP Contractor shall flush the transfer pipeline within 14 calendar days of each transfer, subject to the following conditions:

- a) The flush may be substituted by another treated LAW feed transfer, which is then subject to the same flush requirements.
- b) The flush volume shall be at least 1.5 times the transfer pipeline volume. The flush volume shall be minimized to the extent practical to preserve DST space.
- c) Flushing mediums pre-approved by TOC for use include raw water or deionized/demineralized water. The use of potable water is not allowed.
- d) The use of WTP process condensate water for flushing shall be allowed with written TOC authorization.

**Requirement Basis:**

Potential exists to plug a waste transfer line during transfer of waste to and from waste treatment facilities. This flushing requirement is derived from previous Hanford waste transfer experience summarized in TFC-ENG-STD-26 (WRPS 2019c) and is intended to protect the waste transfer piping from solids formation.

**Configuration Management Documents:**

Requirement Source(s):

- TFC-ENG-STD-26, *Waste Transfer, Dilution, and Flushing Requirements* (WRPS 2019c)
- 24590-WTP-RPT-OP-01-001, *Operations Requirements Document* (BNI 2019h)

Implementation:

- The implementing mechanism(s) and traceability shall be established within the WTP Requirements Management Program. The current implementation status can be obtained from the Mission Integration RAM as identified in *Designation of Requirement Area Managers and Subject Matter Experts* (BNI 2019b).

### 3.3.2 TOC Programmatic Requirements

- 3.3.2.1 The TOC will provide treated LAW feed to WTP that meets the acceptance criteria in Table 5 (consistent with the LAW TSR SAC for waste acceptance).

**Requirement Basis:** The WTP will begin initial operations by processing tank waste pretreated by the TOC and delivered directly to the LAW Facility. Since the design of the LAW Facility was established before the DFLAW concept was implemented, treated feed must be within the existing design and safety parameters for the LAW Facility. The initial set of acceptance criteria was defined from this concept, and agreed to by ORP, TOC, and WTP in CCN 277593 (DOE 2015). The DOE letter in CCN 277593 was incorporated into Section H.53(c)(2) through Contract Modification 350 (CCN 280439 [BNI 2015a]) and Contract Modification 384 (CCN 293870 [BNI 2016q]).

The Waste Acceptance Process in Section 3C.5 of the WTP DWP (WA7890008967) states that the TOC will characterize staged DST waste feed. Prior to transferring the feed, the WTP Contractor evaluates the characterization data for conformance with the WTP

acceptance criteria and ensures that the staged feed planned for receipt meets the acceptance criteria.

The *Documented Safety Analysis for the Low-Activity Waste and Effluent Management Facilities* (BNI 2021f) established the Waste Acceptance Criteria SAC to limit the hazardous material inventory received at the LAW Facility or EMF to protect key safety analysis conclusions. This SAC protects multiple assumptions important to the hazard analysis, regarding the evaluated hazard categorization, and hazardous constituents forming the basis for hazards and consequence analyses. The SAC includes performance criteria to be verified prior to every batch transfer of treated LAW feed to the LAW Facility. The SAC is implemented through the LAW TSR (BNI 2021g).

**Configuration Management Document(s):**

Requirement Source(s):

- WTP Contract (DOE 2000)
- *Transmittal of the Revised Design Inputs for the Direct Feed Low-Activity Waste Initiative*, CCN 277593 (DOE 2015)
- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)
- *Documented Safety Analysis for the Low-Activity Waste and Effluent Management Facilities*, 24590-LAW-DSA-NS-18-0001 (BNI 2021f)
- *Low-Activity Waste and Effluent Management Facilities Technical Safety Requirements*, 24590-LAW-TSR-NS-18-0001 (BNI 2021g)

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

3.3.2.2 The TOC will ensure that treated LAW feed in the Interim LAW Storage Tank (AP-106) does not carry waste codes D001 (ignitability) and D003 (reactivity).

**Requirement Basis:** The Resource Conservation and Recovery Act (RCRA) Part A Permit for the DSTs identifies the characteristic codes for ignitable (D001) and reactive (D003) waste. However, based on past process knowledge, which includes the age, temperature, history, and chemical composition of the waste feed stored in the DST system unit, it is not expected that the waste will exhibit the characteristics of ignitability or reactivity defined in WAC 173-303-090. Per Table 3C-1 of Section 3C.4 of the WTP DWP (WA7890008967), waste pretreated or conditioned to meet LAW Facility waste acceptance criteria will not have the D001 or D003 codes.

**Configuration Management Document(s):**

Requirement Source(s):

- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

3.3.2.3 If a DFLAW feed campaign is outside the applicable acceptance criteria limits, the WTP Contractor and the TOC will prepare a joint assessment and recommend the preferred

method(s), if possible and practical, to correct any feed composition or property deficiencies for DOE review and approval for subsequent WTP Contractor acceptance of treated LAW feed.

**Requirement Basis:** The *Integrated DFLAW Feed Qualification Data Quality Objectives* (BNI 2020p) defines five principal study questions for TOC to transfer staged DFLAW feed to TSCR and provide the treated LAW feed to WTP. All five questions must have a “yes” answer to allow the transfer. If the answer to any one of the questions is “no”, the DFLAW DQO provides a set of alternative actions to be implemented. The combination of principal study questions and alternative actions provides the decision statement for the DQO process.

Section 3C.5 of the WTP DWP (WA7890008967) provides a similar set of alternatives in the event that one or more of the acceptance criteria are not met.

**Configuration Management Document(s):**

Requirement Source(s):

- *Integrated DFLAW Feed Qualification Data Quality Objectives*, 24590-LAW-RPT-PENG-16-003 (BNI 2020p)
- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

3.3.2.4 The TOC will provide composition data for treated LAW feed from the Interim LAW Storage Tank (AP-106) to the WTP Contractor to evaluate for feed blending and process control.

**Requirement Basis:** To prepare the CRV batch sheet, which provides the batch transfer volume and the volume of concentrate recycled from the EMF, the WTP Contractor needs the expected composition of the treated LAW feed to be transferred. The composition data is an input to the ILAW Glass Formulation Algorithm, which calculates the volumes of feed and recycle to be transferred.

Sampling and analysis of the ILST (AP-106) to support batch transfers is not practical.

TOC will develop an Inventory Forecasting Tool to provide an approximation of the real-time inventory in the ILST (AP-106). The TOC plans to validate the tool with samples from AP-106 as described in the *Integrated DFLAW Feed Qualification Program Description* (BNI 2021e). This tool and the feed qualification sample results will be used to estimate the chemical and radionuclide composition in the Interim LAW Storage Tank (AP-106). TOC will update the tool and provide data as necessary for glass formulation purposes.

**Configuration Management Document(s):**

Requirement Source(s):

- *Integrated DFLAW Feed Qualification Program Description*, 24590-WTP-PD-RAEN-EN-0008 (BNI 2021e).
- *Batch Processing Methodology for the Low-Activity Waste Facility*, 24590-LAW-RPT-PENG-16-004 (BNI 2020m).

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

- 3.3.2.5 After treated LAW feed is received into WTP, the TOC will perform volume transfer and receipt comparison measurements with the WTP Contractor to ensure that the volume of waste feed transferred is the volume of waste feed that was received.

**Requirement Basis:** Section 3C.5 of the WTP DWP (WA7890008967) provides steps to describe the WTP waste acceptance process. The final step in the process describes that the TOC and WTP compare volume transfer measurements. Completion of this step indicates that none of the DFLAW treated feed was leaked or mis-transferred during the batch transfer from Tank Farms to WTP.

**Configuration Management Document(s):**

Requirement Source(s):

- *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Chapter 3C (WA7890008967)*

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

- 3.3.2.6 The TOC will notify the WTP Contractor of the following:

- Any operations interruptions of more than 14 days that could impact delivery of treated LAW feed batches.
- Cover block removal of the AP-06A pit that requires administrative lockout or isolation of active waste transfer pumps.
- Any maintenance activities that require coordination of lockout/tagout across the interface.

**Requirement Basis:** Notification of significant TOC shutdowns allows the WTP Contractor to coordinate activities that could interrupt processing of DFLAW feed. Advance notice, if possible, could provide time for the WTP Contractor to plan such activities. The duration for interruption of operations is based on Tank Farms standard *Waste Transfer, Dilution, and Flushing Requirements* (WRPS 2019c), which requires a transfer line to be flushed if there are no transfers within 14 days.

SAC 5.8.10, *AP-02D and AP-06A Cover Block Removal* (under development by WRPS) will require isolation of active waste transfer pumps that are either physically connected to the SN-637 waste transfer line or have the potential to be physically connected to the AP-06A pit as the result of a misroute. The impacted WTP pumps have been identified as DEP-PMP-00003A/B in the EMF. The safety function of the SAC is to protect the facility worker from wetting spray/jet/stream leaks in a waste-transfer-associated structure due to a waste transfer leak.

**Configuration Management Document(s):**

Requirement Source(s):

- *ICD 24590-WTP-ICD-MG-01-030, Rev 1, Programmatic Requirements Meeting (Concepts B: Batch Transfer Process), CCN 314460 (BNI 2019o)*
- *Interface Process Hazard Analysis Control Decision Meeting Minutes, WRPS-2000823 (WRPS 2020b)*

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

3.3.2.7 The TOC will provide data based on process monitoring, modeling, calculations, process knowledge, or sampling to verify that the following acceptance criteria are met for treated LAW feed to be delivered to WTP: Cs-137 concentration, suspended solids concentration, and feed temperature.

**Requirement Basis:** Not all of the parameters listed in the treated LAW feed acceptance criteria can be verified from the qualification sample taken from the Staging and Characterization Tank (AP-105). The parameters listed above will need verification downstream of TSCR to support acceptance of batch transfers from the Interim LAW Storage Tank (AP-106) to the LAW Facility.

The *Integrated DFLAW Feed Qualification Data Quality Objectives* (BNI 2020p), Section 4.2, notes that the original qualification process called for a verification sample of treated LAW feed to confirm that limits were met for parameters that were impacted by the treatment process. The *Integrated DFLAW Feed Qualification Program Description* (BNI 2021e) describes the use of the AP-106 Inventory Forecasting Tool and a bounding salt solubility model to verify TSCR performance. The salt solubility model uses concentrations of selected ions to verify that the salts most likely to precipitate will remain within their solubility limits, confirming that no post-filtration precipitation should occur.

**Configuration Management Document(s):**

Requirement Source(s):

- *Integrated DFLAW Feed Qualification Data Quality Objectives*, 24590-LAW-RPT-PENG-16-003 (BNI 2020p)
- *Integrated DFLAW Feed Qualification Program Description*, 24590-WTP-PD-RAEN-EN-0008 (BNI 2021e).

Implementation:

- Implementing mechanisms for this requirement will be provided by the TOC.

## 4 Requisite Interface Items

Some interfaces may have additional actions to be performed to establish a complete interface. Any of these actions that do not fall into the above requirements categories are listed as requisite interface items. These items are typically single actions to be performed prior to commissioning. A requisite interface item is considered completed when objective evidence is provided to verify the action was performed. The requisite interface items are excluded from the WTP Requirements Management Program and associated procedures. The Mission Integration RAM may use the requirements management tool to track requisite interface items.

### 4.1 WTP Contractor Requisite Interface Items

- 4.1.1 The WTP Contractor will provide a list of data needed for qualification evaluation to the TOC, along with a recommended format and method of delivery.

### 4.2 TOC Requisite Interface Items

- 4.2.1 TOC will establish a control to prevent inadvertent transfer of radioactive material prior to connection of the transfer line. The control remains in place until WTP is approved for radioactive operations/hot commissioning.

## 5 References

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## Appendix A - ICD 30 Issues and Open Items

NOTE: This appendix lists open ICD issues, ICD issues that have been closed since the last revision, and new ICD open items. New open items are added to each ICD revision with a tracking number or schedule activity to track their completion outside the ICD. Open items are removed from the ICD in the next revision following their introduction.

| Issue/Action/<br>Open Item No.                          | Description  | Tracking No                    | Responsible<br>Org. | Responsible Actionee | Originator  | Status/<br>Due Date | Support Information / Basis for<br>Closure   | Comments |
|---|--|--------------------------------|---------------------|----------------------|-------------|---------------------|--|----------|
| <b>Issue I30-01</b>                                     | Table 1 and Sections 2.1.2, 2.1.3, 2.2, 2.3, 2.5, 2.6, and 2.7 of revision 0 of this ICD contain scope that is beyond the design phase for DFLAW. For implementation of these sections, complete a WTP Contract modification to include DFLAW procurement, construction, startup, and commissioning scope that is currently outside the current specification in the WTP Contract. | 24590-WTP-ATS-MGT-15-0431      | WTP                 | Bruce Schappell      | None listed | Closed<br>3/31/2017 | Closure of this issue was implemented by BNI contract modification #384. ORP approval to support closure of ATS item 24590-WTP-ATS-MGT-15-0431 is evidenced by CCN 293870, issued 12/21/2016. Formal ORP concurrence to close this specific ICD issue as detailed herein was received on 03/09/2017 (CCN 269152).  |          |
| <b>Issue I30-02</b>                                     | Analysis of DFLAW feed samples from the qualification DST is not identified as either the TOC or the WTP Contractor scope.   | 24590-WTP-ATS-MGT-15-0432      | WTP                 | Bob Henckel          | None listed | Closed<br>5/22/2017 | <i>One System Decision Document 0007</i> (CCN 282252) recommends the use of the Hanford Site 222-S Laboratory as the DFLAW feed qualification laboratory. 24590-WTP-PD-RAEN-EN-0008, Integrated DFLAW Feed Qualification Program Description, describes the feed samples and the laboratory analysis and testing required to support DFLAW feed acceptance. Since this document provides a defined methodology for handling samples from a qualification tank, I30-02 has been closed. |          |
|   |  | Schedule Activity:<br>WFQ-0625 | TOC                 | Stuart Arm           |             |                     |  |          |
| There are no new issues or open items in this revision. |  |                                |                     |                      |             |                     |  |          |



## Appendix B - Definitions

This appendix was developed as a reference to standardize the definition of terms used for direct LAW feed between the TOC and the WTP Contractor. Of importance is the WTP Contractor's definition of the terms which are used to determine the acceptance criteria values in Table 5.

### General Definitions

- **Batch**  
A discrete volume of treated LAW feed transferred from the ILST (AP-106) to a LAW Facility CRV.
- **Campaign**  
A volume of staged feed, nominally in a 1M gallon DST, that is to be treated using a similar processing strategy.
- **Concentrate Receipt Vessel**  
The CRVs are part of the LAW concentrate receipt process system (LCP). The two vessels are designed to receive concentrated LAW feed from the Pretreatment Facility and then transfer the feed to the LAW melter feed process system (LFP). In DFLAW operation, these vessels receive treated LAW feed from the AP Tank Farm and function as feed receipt vessels.
- **Process Knowledge**  
Working knowledge of processes that is built up over time through on the job experience and lessons learned.
- **DFLAW Feed**  
Tank waste qualified in the Staging and Characterization Tank (AP-105) that has been selected for processing.
- **Treated LAW Feed**  
The supernatant stream treated by the TOC for delivery to the WTP.
- **Treated LAW Feed Acceptance Criteria**  
Quantified limitations on treated LAW feed parameters established to protect the WTP design or safety basis and meet environmental permit requirements.

### Treated LAW Feed Acceptance Criteria (Table 5) Definitions

- **Feed Receipt Temperature**  
Monitored in the TOC ILST (AP-106) or transfer line during the entirety of the feed transfer.
- **Hydrogen Generation Rate**  
Determined using the entire slurry and at the temperature listed. Result is determined from the measured hydrogen generation rate (g-mol H<sub>2</sub>/hr) and the volume tested (L). The unit hydrogen generation rate (g-mol H<sub>2</sub>/L/hr) is to be determined by sample and analysis.
- **Feed Bulk Density**  
Density of the entire stream, including any solids present. Results are to be determined after holding the sample at 25 °C for 8 hours.

- **Feed Viscosity**

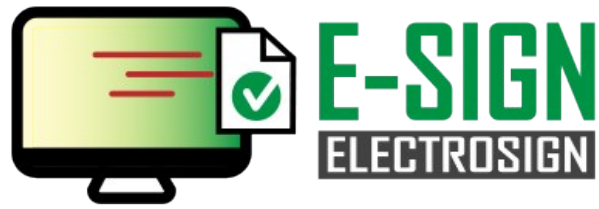
Viscosity of the entire stream, including any solids present. Results are to be determined after holding the sample at 25 °C for 8 hours.

- **Separable Organics**

Separable organics are organic compounds (carbon-based molecules) that are present in concentrations beyond their saturation point. The saturation point for a sample is determined by holding it at 25 °C for 8 hours. If the organic species separates as a solid or liquid under these conditions, the organic is deemed “separable.”

- **Suspended Solids Concentration**

Suspended solids in treated LAW feed is a measurement of the dry weight of solids not dissolved in the carrier solution and is defined as the product of centrifuging the feed, separating and drying the solids, and removing the dissolved solids contribution. Results are expressed in weight percent solids in the treated LAW feed (mass of dry solids / mass of slurry) and are to be determined after holding the sample at 25 °C for 8 hours.



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## Document for Signature

**Document Number:** 24590-WTP-ICD-MG-01-030 **Rev:** 1

| Participants          | Signature                | Completed         | Status    | Result  | Comments |
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