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Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Pretreatment Facility and High-Level Waste Vitrification Facility

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Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Executive Summary

This document satisfies the requirements of the River Protection Project Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit (DWP) and the Washington Administrative Code (WAC), 173-303-640(3)(b), which provide for development and submittal of a program and schedule for conducting integrity assessments over the life of the regulated tanks and miscellaneous units identified in the DWP. This document addresses the WTP pretreatment facility (PTF) and the high-level waste (HLW) vitrification facility DWP-regulated tanks and miscellaneous units (and associated secondary containment and ancillary equipment) and has been developed to ensure that these regulated plant items, which manage dangerous waste, will not collapse, rupture, or fail. The regulated equipment in the WTP analytical laboratory and low-activity waste (LAW) vitrification facility is addressed in the *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility* (24590-WTP-PER-M-08-001).

The WTP PTF and HLW vitrification facility contain new tank systems and miscellaneous units designed and installed in accordance with WAC 173-303-640(3) and WAC 173-303-680. This document describes the design features, materials of construction, and supplier and installation quality programs that establish the baseline conditions and measurements to allow comparisons with future integrity assessment measurements for tanks, miscellaneous units, breakpots, bulges, sumps, and piping installed in the PTF and HLW vitrification facility. The baseline conditions in conjunction with operating conditions are used to establish the schedule for the initial integrity assessment following hot commissioning.

Acronyms

ABMA	American Bearing Manufacturers Association
ADS	air displacement slurry
AEA	Atomic Energy Act of 1954
AISC	American Institute of Steel Construction
ALARA	as low as reasonably achievable
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ASX	autosampling system
CCTV	closed-circuit television
CDR	construction deficiency report
CFR	Code of Federal Regulations
CNP	cesium nitric acid recovery process system
CO_2	carbon dioxide
CRP	cesium resin addition process system
Cs	cesium
CXP	cesium ion exchange (IX) process system
DIW	demineralized water system
DOE	United States Department of Energy
DSS	Duplex Stainless Steel
DWP	dangerous waste permit
ETF	Effluent Treatment Facility
°F	degrees Fahrenheit
FEP	waste feed evaporation process system
FRP	waste feed receipt process system
ft	feet
HCP	HLW concentrate receipt system
HDH	HLW canister decontamination handling system
HEME	high efficiency mist eliminator
HEPA	high efficiency particulate air
HFP	HLW melter feed process system
HI	Hydraulic Institute Standards
HLP	HLW storage and feed blending process system
HLW	high-level waste
HMP	HLW melter process system
HOP	HLW melter offgas treatment process system
HSH	HLW melter cave support handling system
HVAC	heating, ventilation and air-conditioning
IHLW	immobilized high-level waste
IQRPE	independent, qualified, registered professional engineer
IX	ion exchange
LAW	low-activity waste
LDB	leak detection box

LERF	Liquid Effluent Retention Facility
MFPV	melter feed preparation vessel
MFV	melter feed vessel
mg/L	milligrams per liter
MTG	metric tons of glass
MTG/day	metric tons of glass per day
N_2	nitrogen
NCR	nonconformance report
NDE	non-destructive examination
NOx	nitrogen oxides
O_2	oxygen
%	percent
PIH	pretreatment in-cell handling system
PJM	pulse jet mixer
PJV	pulse jet ventilation system
PTF	pretreatment facility
PVP	pretreatment vessel vent process system
PVV	process vessel vent exhaust system
PWD	pretreatment plant wash and disposal system
RDMC	remote decontamination maintenance cave
RDP	spent resin and dewatering process system
RFD	reverse flow diverter
RLD	radioactive liquid waste disposal system
SBS	submerged bed scrubber
SNT	American Society for Nondestructive Testing, Inc.
SPC	special protective coating
sq ft	square foot
Sr	strontium
TCP	treated LAW concentrate storage process system
TLP	treated LAW evaporation process system
TRU	transuranic elements
UFP	ultrafiltration process system
UNS	unified numbering system for metals and alloys
VOC	volatile organic compound
WAC	Washington Administrative Code
WESP	wet electrostatic precipitator
WTP	Waste Treatment and Immobilization Plant
wt%	weight percent

1 Purpose

For owners and operators of tanks used to manage dangerous waste, the Washington Administrative Code (WAC), 173-303-640(3)(b) requires that: "The owner or operator must develop a schedule for conducting integrity assessments over the life of the tank to ensure that the tank retains its structural integrity and will not collapse, rupture, or fail. The schedule must be based on the results of past integrity assessments, age of the tank system, materials of construction, characteristics of the waste and any other relevant factors."

River Protection Project Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit (DWP) implements the WAC requirements via conditions that require, prior to the initial receipt of dangerous waste, the submittal of an integrity assessment program and schedule for all tanks managing dangerous waste (DWP condition III.10.E.9.e.i), pretreatment facility (PTF) miscellaneous units (DWP condition III.10.G.10.e.i), low-activity waste (LAW) vitrification system equipment (DWP condition III.10.H.5.e.i and III.10.I.1.a.v), and high-level waste (HLW) vitrification system equipment (DWP condition III.10.J.5.e.i and III.10.K.1.a.v). This document addresses WAC 173-303-640(3)(b). Other WAC requirements will be addressed in future permitting submittals such as the inspection plan, contingency plan, waste analysis plan, closure plan, and certifications provided by the independent, qualified, registered professional engineer (IQRPE).

The purpose of performing integrity assessments is to prevent the collapse, rupture or failure of a component that could result in an unacceptable release of dangerous waste to the environment or could result in an impact to plant operations/activities that would adversely affect the capability of the WTP facilities to perform the overall mission of waste treatment. The purpose of this document is to describe the design features associated with the tanks, miscellaneous units, and underground transfer lines managing dangerous waste and to provide the program and schedule for integrity assessments for DWP-regulated equipment in the PTF and HLW vitrification facility. The tanks and miscellaneous units described in this document are those presented in 24590-WTP-RPT-ENV-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit.* The design features provided in this document were compiled from other approved WTP documents; no new design features were developed in this document. Some tanks, miscellaneous units, and ancillary equipment that manage dangerous waste have been added or removed from the design since the last revision of 24590-WTP-RPT-ENV-03-002. Added or removed equipment subject to the DWP is noted in the appropriate sections below. Based on a review of the existing information, this program and schedule for integrity assessments was prepared.

The integrity assessment program and schedule for DWP-regulated equipment in the analytical laboratory and LAW vitrification facility is presented in 24590-WTP-PER-M-08-001, *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility.*

2 Establishing a Baseline

The WTP PTF and HLW vitrification facility contain new tank systems and miscellaneous units designed and installed in accordance with WAC 173-303-640(3) and WAC 173-303-680. This section presents information on supplier and installation quality programs, pre-operations baseline measurements,

materials of construction, and corrosion and erosion considerations that is used to establish baseline conditions and measurements to allow comparisons with future integrity assessment measurements. The baseline conditions in conjunction with operating conditions are also used to identify tanks and miscellaneous units with lower potential for corrosion and erosion and with higher potential for corrosion and erosion (Section 7.1.2).

This information is then used to establish the schedule for the initial integrity assessment following hot commissioning. Additionally, this section describes the radiological area classifications for the WTP facilities, which determine the accessibility of tanks and miscellaneous units for integrity assessments following hot commissioning.

The WTP Project organizational charts (24590-WTP-ORC-HR-01-001) cover the design, procurement, construction, and startup phases of WTP and illustrate the program structure and interaction of the functions and disciplines that directly impact features of design, procurement, construction, and commissioning for DWP-regulated equipment. These functions and disciplines include the following at a minimum: environmental and nuclear safety manager, quality and performance assurance manager, safety assurance manager, plant operations manager (startup, commissioning, and training), manager of construction, and manager of engineering. The plant equipment managers report to the manager of engineering.

Section 3 of this document provides a general description of the PTF and HLW vitrification facility, including the layout of each facility and the distribution of the DWP-regulated units within each facility. This information is part of the baseline to establish accessibility of tanks and miscellaneous units for integrity assessments.

Sections 4 and 5 provide detailed descriptions of each DWP-regulated tank and miscellaneous unit including ancillary equipment, associated equipment bulges, and secondary containment for the tanks, miscellaneous units, and bulges. This information provides the basis for establishing an integrity assessment schedule for each DWP-regulated tank and miscellaneous unit.

Section 6 provides a description of underground piping and secondary containment features for transfer of waste between the WTP PTF and the HLW vitrification facility.

Section 7 describes the approach and schedule for integrity assessments to be conducted in comparison to the general baseline conditions and the specific construction and operation details for the DWP-regulated tanks and miscellaneous units described in Sections 2 through 6.

Documents used for the implementation of integrity assessments and reports of assessment results are collected, maintained, and stored in accordance with 24590-WTP-GPP-PADC-002, *Project Records Management.*

2.1 Supplier Quality Program

This section describes the pressure vessel supplier quality control requirements described in 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication,* that are used in conjunction with the pre-operational measurements described in Section 2.3 to establish the non-destructive examination (NDE) baseline prior to installation. The information provided in this section is primarily focused on suppliers of tanks, breakpots, and housings for miscellaneous units, designed to pressure vessel and other standards

(Table 1). The overall supplier quality program that is applicable to tanks, miscellaneous units, breakpots, pumps, piping, and sumps is described in 24590-WTP-3PS-G000-T0001, *Engineering Specification for Supplier Quality Assurance Program Requirements* and supplier submitted Quality Assurance manuals.

Shell and head sections that are subjected to concentrated or large loads through welded attachments are, prior to welding, ultrasonically examined over 100 percent (%) of the areas in accordance with the following:

- For connections or attachments directly welded to the shell or head, the area tested extends 3 inches beyond the extremity of the weldment.
- For connections or attachments welded via a reinforcement or doubler plate, the shell area tested extends 5 inches beyond each side of the perimeter of the fillet weld attaching the reinforcing or doubler plate to the shell or head.

For vessels, all full penetration welds attaching internal or external structural components to the heads or shell are radiographically or ultrasonically tested. If fillet welds are used and are not readily radiographically or ultrasonically tested, they are dye-penetrant tested. All full penetration welds forming part of a jacket are radiographically or ultrasonically tested. All welds joining the nozzle neck to the shell or heads, which are not radiographically or ultrasonically tested, are dye-penetrant tested.

For vessels, all radiography, ultrasonic testing, and dye-penetrant examinations are performed in accordance with American Society of Mechanical Engineers (ASME) Section VIII, Division 1 and ASME Section V.

NDEs, including visual, dye-penetrant, ultrasonic, and radiography, of tanks, breakpots, and housings for miscellaneous units are carried out after the completion of fabrication, including any heat treatment. NDEs are performed by an inspector certified to the requirements of American Society for Nondestructive Testing, Inc. (SNT) SNT-TC-1A. The interpretation of the results is by either Level II or Level III inspectors certified to SNT-TC-1A.

Ultrasonic testing of tanks and components built to ASME Section VIII, Division 1, is in accordance with Appendix 12 of ASME Section VIII, Division 1. Radiographic acceptance criteria of tanks and components built to ASME Section VIII, Division 1, are in accordance with ASME Section VIII, Division 1, paragraph UW-51 for full radiography and UW-52 for spot radiography.

Baseline NDE measurements as described in Section 2.3 are conducted to establish the baseline condition of equipment in known locations prior to start of dangerous waste operations. The weld and NDE inspection records and associated quality control documents provided by the vendors may also be used to supplement the baseline NDE measurements to establish the baseline condition of tanks, breakpots, and housings for miscellaneous units prior to start-up and operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of tanks, breakpots, and housings for miscellaneous units and to determine whether the schedule of future assessments should be adjusted.

2.2 Installation Quality Program

The installation of all equipment during the construction phase, including DWP-regulated items, is governed by issued design documents and controlled by quality control procedures. For work performed by direct hire personnel or subcontractors, 24590-WTP-GPP-CON-7101, *Construction Quality Control Program* and 24590-WTP-GPP-CON-4103, *Subcontractor Surveillance, Acceptance, and Closeout* identify responsibilities of installers, field engineers, quality control engineers, and management to ensure items are installed, inspected, tested, and documented. Prior to covering, enclosing, or placing new DWP-regulated plant item(s) in use, an independent, qualified installation inspector or an IQRPE, either of whom is trained and experienced in the proper installation of regulated plant items, inspects the system for the presence of any of the following items:

- weld breaks
- punctures
- scrapes of protective coatings
- cracks
- corrosion
- other structural damage or inadequate construction/installation

The following documentation is considered by the independent, qualified installation inspector, or IQRPE, in certifying proper installation of DWP-regulated plant items:

- approved welding procedures
- welder qualifications and certifications
- field installation reports
- tightness test reports in accordance with the codes specified by design
- inspector credentials
- field waiver reports (i.e., nonconformance reports [NCRs], construction deficiency reports [CDRs])
- non-compliance reports, corrective action and repair reports (i.e., NCRs, CDRs)

The results of construction inspections and the independent, qualified installation inspector's or IQRPE's inspections at the time of installation of tanks, miscellaneous units, breakpots, bulges, sumps, and piping and review of associated documents are used to establish the baseline condition of DWP-regulated equipment prior to start-up and operations. Results of future integrity assessments are compared to the baseline condition to evaluate the structural integrity of tanks, miscellaneous units, breakpots, bulges, sumps, and piping and to determine whether the schedule of future assessments should be adjusted.

2.3 Pre-Operational Baseline Measurements

Pre-operational baseline NDE measurements are performed on DWP-regulated plant items in the PTF and HLW vitrification facility prior to the initial receipt of dangerous waste. The objective of these measurements is to provide data representative of the initial thicknesses of the plant items in known locations. For DWP-regulated plant items located in black cells or hard-to-reach locations, baseline NDE measurements are obtained prior to closure of the cells. By design, when construction is complete, black cells have no operating access for equipment maintenance or entry during the 40-year life of the facility.

Hard-to-reach areas are designed for no manual or remote equipment access, replacement, or repair. For accessible regulated plant items, results of future integrity assessment NDE measurements will be compared to these pre-operational baseline NDE measurements to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted. For inaccessible regulated plant items (equipment in black cells or hard-to-reach areas), NDE measurements on accessible equipment will be used as surrogates for comparison to pre-operation baseline measurements. Integrity assessments conducted during the life of a regulated plant item are discussed in Section 7. Use and identification of accessible regulated plant items as surrogates for inaccessible plant items is described in Section 7.

Corrosion and erosion rates are affected by parameters such as material of construction, temperature, chemistry, flow rate, stress, vibration, fluid velocity, particle size, and solids concentration. DWP-regulated plant items in the PTF and HLW vitrification facility are susceptible to various types of damage by several corrosion and erosion mechanisms. The portions of regulated plant items most likely affected by corrosion and erosion are dependent on the kind of equipment (e.g., tanks versus miscellaneous equipment) and can be markedly different. Therefore, this section provides general locations that are considered susceptible areas where pre-operational baseline NDE thickness measurements are to be performed. In consultation with a corrosion specialist or engineer, specific NDE measurement locations are selected after the installation of the regulated plant item and before the initial receipt of dangerous waste. The portions of regulated plant items that are identified as locations for NDE measurements are based on:

- Material of construction
- Corrosive characteristics of the waste
- Erosive characteristics of the waste
- The velocity or turbulence of waste at the NDE measurement location
- Scope of information to be obtained (representative of other tanks or piping)
- Access to the NDE measurement location (either manually or remotely)
- NDE measurement methods, scope, tools, and techniques that can be used
- Radiation exposure to personnel performing NDE measurements

Specific NDE measurement locations for welds or wall thicknesses are illustrated in Appendix B. These drawings are provided as information becomes available and are to be included in future revisions of this document; a set of drawings will be made available no later than 6 months prior to cold commissioning. NDE measurement locations are also marked on the DWP-regulated plant items to allow repetitive measurements at the same locations. Repeating measurements at the same locations improves accuracy of the calculations of the expected remaining corrosion and erosion allowances of the regulated plant items.

Baseline and subsequent thickness measurements are made in accordance with written procedures implementing the requirements of American Society for Testing and Materials (ASTM) E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method. Section 9 of ASTM E 797 provides the requirements for developing a detailed written procedure.

2.3.1 Accessible Tanks and Other Regulated Equipment Designed to ASME Pressure Vessel or API Tank Standards

At least one accessible location for thickness monitoring is selected at each of the following major components of an accessible tank:

- Top head (e.g., an area where a connection or attachment is directly welded to the head)
- Bottom head, especially in an area of high potential erosion (e.g., an area where eductor discharge impinges on the bottom head)
- Shell (e.g., an area where a connection or attachment is directly welded to the shell, longitudinal weld attaching the head to the shell, region of the normal operating liquid-vapor interface or high-liquid level, vertical strip along the accessible height of the tank, and horizontal arc along the accessible height of the tank)

For accessible tanks with cooling jackets, measurements are made in the accessible portions of the tank directly above or below the cooling jacket.

2.3.2 Other Accessible Miscellaneous Units

Several miscellaneous units such as filters, which have internal components that are replaced periodically, are contained in housings that are not designed to ASME pressure vessel standards. Thickness measurements are performed on the external containment housings of these units. At least one accessible location for thickness monitoring is selected at the top, side, and bottom of the accessible housing, especially in an area where a pipe, connection, or attachment is directly welded to the top, side, or bottom.

2.3.3 Accessible Piping and In-Line Components

For accessible piping, including jumpers, connecting tanks, miscellaneous units, breakpots, bulges, and sumps, at least one representative location for thickness monitoring is selected at the following:

- An area along a straight run of the pipe
- An area near a connecting fitting where flow direction or velocity changes (e.g., elbow, mixing tee, wye, cross, reducer, flange, and valve)
- An area near the insulation, if applicable, where operating temperatures cause frequent or continuous condensation and re-evaporation of moisture

For in-line components such as electric heaters, heat exchangers, and fans, thickness measurements are performed on the external containment housings of these units. At least one accessible location for thickness monitoring is selected at the top, side, and bottom of the accessible housing, especially in an area where a pipe, connection, or attachment is directly welded to the top, side, or bottom.

2.3.4 Bulges and Accessible Sumps

For bulges (by design, bulges are in accessible locations) and accessible sumps, at least one accessible location for thickness monitoring is selected at the following:

- Bottom, especially at the lowest point of a sloped bottom

- Sidewall (e.g., an area where a pipe, connection, or attachment is directly welded, longitudinal weld attaching the head to the shell for circular sumps, and vertical weld attaching the sidewalls for rectangular sumps)

2.3.5 Underground Transfer Lines

Since access to the underground transfer lines between the WTP facilities is not possible without excavation, pre-operational baseline and future NDE measurements of these lines are not conducted. As described in Section 6, the underground transfer lines are double-walled. The secondary encasement pipe has a fusion bounded epoxy coating with shrink wrap sleeves covering the clamshell welds and a cathodic protection system using an impressed current system. Corrosion of the secondary containment pipe is not expected to occur due to the epoxy coating and cathodic protection system.

2.4 Materials of Construction

In order to ensure tanks, miscellaneous units, and ancillary equipment last for 40 years, corrosion resistant materials, based on operating conditions and expected waste chemistries have been identified; sufficient corrosion and erosion allowances have been specified; and robust design codes (such as ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME B31.3-96, Process Piping) have been used. Table 1 lists design codes for DWP-regulated tanks, miscellaneous units, breakpots, bulges, sumps, pumps, and piping in the PTF and HLW vitrification facility. Table 2 presents the materials of construction and corrosion and erosion allowances for these regulated tanks, miscellaneous units, breakpots, bulges, sumps, pumps, and piping.

Where a potential for erosion exists (due to entrained solids and/or velocities), additional allowance, more erosion resistant materials, or hardfacing is provided. Documentation of positive material identification is provided by vendors and field inspectors (24590-WTP-3PS-G000-T0010, 24590-WTP-3PS-G000-T0002, and 24590-WTP-GPP-PSQ-051, *Positive Material Identification*) and contributes to establishing the baseline for integrity assessments.

The following paragraphs provide background information on the materials of construction and selection rationale used for regulated equipment in the PTF and HLW vitrification facility.

2.4.1 Stainless Steel 304L and 316L

The majority of the DWP-regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping in the PTF and HLW vitrification facility are made of stainless steel 304L and 316L. Stainless steel 304L and 316L are used for sodium hydroxide-containing waste at temperatures between 140 and 200 degrees Fahrenheit (°F). Stainless steel 304L is better than stainless steel 316L in nitric acid, but in the presence of chlorides, stainless steel 316L is more resistant to pitting and cracking. However, at a pH greater than 12, chlorides are not believed to be a major concern, except possibly in tight crevices.

The presence of acids and/or halides and higher temperatures can increase the corrosion rates of stainless steel 304L and 316L.

2.4.2 Stainless Steel 347

The hot-side components and high temperature elements of a few miscellaneous units in the HLW vitrification facility are made of stainless steel 347. These units are part of the system managing secondary offgas. Stabilized austenitic type 347 stainless steel is suitable for high temperature applications where stainless steel 316L is precluded and dry-air conditions are not conducive to general corrosion.

2.4.3 Nickel, Chromium, Molybdenum Alloys

Several DWP-regulated tanks, miscellaneous units, sumps, and piping in the PTF and HLW vitrification facility are made of alloys such as 6% molybdenum and high nickel alloys such as Alloy C-22 and Alloy 690. These alloys tend to be more resistant to acids (low pH) and chlorides than are the 300 series stainless steels. The presence of acids and/or halides and higher temperatures can increase the corrosion rates of stainless steel 304L and 316L. High nickel alloys are somewhat better in alkaline conditions, especially at higher temperatures.

2.4.4 Titanium

Titanium has excellent corrosion resistance due to the stable, continuous, highly adherent, and protective oxide film on its surface. The inert oxide film forms spontaneously and instantly when the fresh metal surface is exposed to air and/or moisture. Titanium is generally more resistant to pitting corrosion, stress corrosion, crevice corrosion, and galvanic corrosion than the 300 series stainless steels.

Titanium is highly resistant to oxidizing acids such as nitric, chromic, and perchloric acids. These oxidizing compounds assure oxide film stability. Titanium offers excellent resistance to corrosion over the full concentration range of nitric acid at sub-boiling temperatures. At higher temperatures, however, titanium's corrosion resistance is highly dependent on nitric acid purity. In hot, very pure solutions or vapor condensates of nitric acid, significant corrosion may occur. On the other hand, various metallic species such as silicon, chromium, iron, or various precious metal ions (i.e., platinum and ruthenium) in very minute amounts tend to inhibit high temperature corrosion of titanium in nitric acid solutions. Titanium's own corrosion product, titanic ion, is also a very potent inhibitor.

Titanium offers moderate resistance to reducing acids such as hydrochloric, sulfuric, and phosphoric acids. Corrosion rates increase with increasing acid concentration or temperature. Small amounts of certain multi-valent metal ions in solution (e.g., ferric ion) can effectively inhibit the corrosion of titanium in reducing acids. In addition, the addition of nitric acid (an oxidizing acid) to hydrochloric or sulfuric acids significantly reduces corrosion rates. Corrosion rates in mixed acids generally rise with increases in the reducing acid component concentration or temperature.

The canister decontamination vessels (HDH-VSL-00002 and HDH-VSL-00004) and associated piping in the HLW vitrification facility are made of titanium, grade 2. Ceric ion, a strong oxidizing agent in nitric acid, is used in the decontamination process. Titanium, grade 2, is expected to have a corrosion rate of less than 0.008 inch per year in boiling, 20% nitric acid. The presence of 80 mg/L titanic ion reduces the corrosion rate in boiling 45% nitric acid to less than 0.001 inch per year. Since the HLW vitrification facility's decontamination system will only use 6% to 12% acid with temperatures normally between 113 to 158°F and due to the presence of ferric and ceric ions in the decontamination solution, the corrosion rate is expected to be much less than 0.001 inch per year.

Hydrogen peroxide can have a significant effect on titanium. At pH 1, the corrosion rates can range from 0.006 to 0.025 inch per year. At pH 11, the corrosion rate is about 0.015 inch per year and at about pH 13.7, the rate is over 2 inches per year. Therefore, the use of titanium is not recommended with hydrogen peroxide (24590-WTP-RPT-M-01-001).

2.4.5 Duplex Stainless Steel

Duplex stainless steel (DSS) comprises a family of stainless steels with a wide range of compositions and corrosion resistance. Duplex stainless steels perform well in environments where water-soluble chloride salts and other halogen compounds can be concentrated. DSS materials are also useful where pitting resistance or where stress corrosion cracking may be a problem for other steels. They are typically higher in chromium and lower in nickel than austenitic stainless steels, have similar molybdenum levels, generally contain nitrogen, and some grades contain copper. The term "duplex" refers to those stainless steels that are chemically balanced to solidify primarily in the ferrite phase, with austenite forming as the secondary phase upon cooling. Composition balancing results in these dual-phase alloys (hence the name duplex), with yield strengths two-to-three times that of the austenitic grades.

The high strength cast DSS having a corrosion resistance with improved chloride stress cracking resistance is known as CD4MCu (UNS J93370) and appeared as a standard DSS grade in 1959. Significant refinements occurred in the following decades, which improved the welding, ductility and corrosion resistance through the use of nitrogen. The distinction between first, and second-generation DSS, focuses on the use of nitrogen as a deliberate alloy addition.

CD4MCu is a Fe-Cr-Ni-Cu-Mo alloy with a duplex structure of ferrite and austenite. Moderately high strength and hardness are combined with good ductility and impact properties, resulting in an alloy with superior resistance to abrasion or erosion-corrosion. In chloride-containing environments, the alloy is highly resistant to stress-corrosion cracking. The alloy is also highly resistant to nitric and sulfuric acids. Castings are most commonly used in the solution annealed condition.

The ferrite balance of duplex alloys must be controlled by controlling the nitrogen levels. ASTM has addressed this issue by introducing CD4MCuN (UNS J93372) into ASTM A 890. Although CD4MCu still exists in ASTM A 890, it is strongly recommended that CD4MCuN be substituted for CD4MCu.

CD4MCu and CD3MCuN are recommended material for pump pressure casings for type D-1 (sour water) service pumps in API 610 - 2004, *Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services.* CD3MCuN (UNS J93373) is also a Fe-Cr-Ni-Cu-Mo alloy with a duplex structure of ferrite and austenite, but has less carbon and copper contents and more manganese, chromium, nickel, and molybdenum content. It is more corrosion resistant and easier to weld.

2.5 Corrosion and Erosion Considerations

The following section describes the potential corrosion and erosion degradation mechanisms that may impact the integrity of the DWP-regulated equipment in the PTF and HLW vitrification facility. These corrosion and erosion mechanisms are factors used in Sections 4 and 5 to characterize the tanks, miscellaneous units, breakpots, bulges, and sumps as having lower or higher potential for corrosion and erosion. This information is used in Section 7 to establish the schedule for the initial integrity assessment

following hot commissioning. Corrosion/erosion allowances for each class of piping material are provided in 24590-WTP-3PS-P000-T0001, *Piping Material Classes General Description and Summary.*

2.5.1 Corrosion

Corrosion is a degradation process affected by many parameters, including temperature, process chemistry, flow rate, stress, and vibration. The underlying process of corrosion may be electrochemical, chemical, mechanical, or a combination of these mechanisms. Combinations of parameters can act synergistically, sometimes reducing the corrosion rate, accelerating the corrosion rate, or changing the corrosion mechanism.

Evaluation, selection, and establishment of corrosion control measures begin with design and are implemented during construction and maintained during operation. Periodic assessments, as described in Section 7, are performed to ensure that DWP-regulated equipment has sufficient structural integrity and are acceptable for the storage and treatment of dangerous materials.

The corrosion degradation mechanisms applicable to the materials of construction selected for the DWP-regulated equipment located in the PTF and HLW vitrification facility are general corrosion, pitting corrosion, end grain corrosion, stress corrosion cracking, crevice corrosion, corrosion at welds, corrosion fatigue, vapor phase corrosion, and galvanic corrosion. A minimum 0.040-inch standard corrosion allowance has been generally specified for DWP-regulated equipment with a design life of 40 years. This corrosion allowance is increased where required for process chemistry reasons or other corrosion or erosion concerns. The corrosion allowances for the regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping located in the PTF and HLW vitrification facility are listed in Table 2.

The majority of the DWP-regulated equipment in the PTF and HLW vitrification facility are constructed of low carbon stainless steel (304L and 316L), which is generally more resistant to pitting corrosion, stress corrosion cracking, and crevice corrosion than the higher carbon stainless steel. Some equipment is made of 6% molybdenum alloy or high nickel alloy (e.g., Alloy C-22) depending on the process chemistry. These materials are more resistant to corrosion in lower pH or higher halide concentrations than the series 300 stainless steels. These materials also maintain stable structures during exposure to high temperatures. Titanium, grade 2, is expected to be more resistant to corrosion in the presence of nitric acid at a high temperature. Titanium's corrosion resistance is highly dependent on nitric acid purity at high temperatures. In hot, very pure solutions or vapor condensates of nitric acid, significant corrosion may occur. Table 3 summarizes the selection rationale for the materials of construction of the regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping in the PTF and HLW vitrification facility.

2.5.2 Erosion

Erosion is the removal of material from a metal surface by the action of particles in a moving liquid or particles in a moving gas. Erosion is a function of the fluid velocity, particle size, particle shape, particle concentration, and hardness of the particles relative to that of the material of construction, among other factors. Erosion-corrosion is corrosion exacerbated by the erosive removal of protective layers (e.g., oxides), which allows corrosion to proceed at a high rate.

The evaluation, selection, and establishment of erosion control measures begin with design and are implemented during construction and maintained during operation. Periodic assessments are performed

to ensure that DWP-regulated equipment have sufficient structural integrity and are acceptable for the storage and treatment of dangerous materials.

The erosion allowances for the DWP-regulated tanks, miscellaneous units, breakpots, bulges, sumps, and piping located in the PTF and HLW vitrification facility are presented in Table 2. A minimum 0.004-inch erosion allowance is generally specified for tanks and miscellaneous units containing liquids with a velocity of less than 12 feet per second and having a design life of 40 years. Normally, a minimum 0.040-inch standard corrosion allowance, which includes the expected wear from both corrosion and erosion, is specified. Additional erosion allowances are specified where required for process chemistry reasons or other erosion concerns.

2.6 Radiological Area Classifications

Access to DWP-regulated equipment for future integrity assessments must be consistent with keeping radiation exposure as low as reasonably achievable (ALARA). Selection of points for future NDE inspection and measurements and scheduling of inspections and measurements must take into account potential radiation exposure.

As a consequence of ALARA requirements, DWP-regulated equipment that are located in black cells, which are designed to require and receive no equipment maintenance or entry during the 40-year life of the facility, are not accessible for NDE measurements following baseline measurements. DWP-regulated equipment located in hard-to-reach areas, which are designed for no manual or remote equipment access, replacement, or repair, are also not accessible for NDE measurements following baseline measurements. DWP-regulated equipment in the PTF and HLW vitrification facility outside of black cells and hard-to-reach areas is generally accessible in that it can be visually and physically examined either directly or, for equipment located in hot cells or melter caves (which are designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility) remotely.

The areas in the PTF and HLW vitrification facility are divided into five numbered zones based on radiological dose rates (R1 to R5) and potential for contamination (C1 to C5), with the higher number indicating the greater hazard potential, and therefore, the greater degree of control and restriction required. Radiation and contamination areas are classified independently in order to differentiate between the need for shielding or confinement. This numbering system is also used to determine the type of control to be applied for access to these areas.

Two dose equivalent rate levels have been established for each radiological classification: a target and a maximum dose equivalent rate. The target dose equivalent rate, if achieved, would be expected to readily satisfy both the requirements of ALARA and the annual dose criteria of 10 Code of Federal Regulations (CFR) 835.202. In contrast, the maximum dose equivalent rate is the level beyond which it would be very difficult to show compliance with the ALARA requirements. As a general rule, the dose rate criteria are applicable at 12 inches from the radiation source or 12 inches from any surface the radiation penetrates, consistent with the definitions of 10 CFR 835.202. Table 4 provides the criteria to be used for each radiological area classification based on dose rate.

Systems containing radioactive substances are provided with suitable isolation provisions to mitigate diffusion, backflow, or other methods of leakage of the contents to areas where the material is not intended. Table 5 provides the criteria to be used for each radiological area classification based on

potential contamination. Table 6 provides the radiological contamination and access classifications for each plant item in the PTF and HLW vitrification facility.

3 Facility Description

This section provides a brief description of the PTF and HLW vitrification facility, and describes the general layout of each facility and the distribution of DWP-regulated tanks and miscellaneous units that are subject to periodic integrity assessments. It also includes a description of underground transfer lines associated with the WTP facilities.

The WTP design incorporates the "black cell" and "hard-to-reach area" concept as a key part of the facility design for the PTF and HLW vitrification facility. For black cells, this entails locating certain equipment in shielded cells (black cells) for which no maintenance or entry is planned for the 40-year design life of the plant. The contents of black cells are limited to tanks and miscellaneous units with their associated pumping, mixing and sampling systems that employ fluidics (air-driven pulse jet mixers [PJMs], reverse flow diverter [RFD] pumps with no moving parts, and steam ejectors) rather than motor-driven pumps or mechanical agitators. Hard-to-reach areas are designed for no manual or remote equipment access or maintenance.

3.1 Pretreatment Facility

The PTF building is a multi-level structure extending from a 45-foot (ft) elevation below grade to a roof at a 119-ft above grade elevation. It includes the gaseous effluent stack structure starting at the roof level and terminating a 200-ft elevation above grade. The PTF building is a mixed-use occupancy building with a 615,219-square foot (sq ft) gross floor area, not including a 15,150-sq ft basement area, housing the processes for pretreating (separation and conversion to a suitable form) both LAW and HLW before transfer to the LAW vitrification facility or HLW vitrification facility for immobilization. The PTF consists of the radioactive material processing area, which is surrounded to the north, south, and east by process bulge, storage, workshop, and change room areas, and the standby control room. Access corridors surround the process and bulge areas on the north, south, and east sides of the building. Cast in place concrete construction is utilized for the building mat foundation, slabs and walls for radioactive shielding of the process cells and other radiological areas. The west exterior wall of the building is constructed of reinforced concrete to the 56-ft elevation level (height of the waste feed receipt cell). The above grade portions of the building consist of a variety of construction methods including, reinforced concrete, structural steel frame, and noncombustible materials. The primary superstructure is a structural steel frame.

The PTF building supports processes that require taller than normal building heights and large areas. The primary interior functions in the PTF building consist of the processing areas in a central hot cell area, multiple black cells, a filter cave, and process bulges all designed to meet confinement and shielding requirements. By design, equipment located in the black cells consists of items that do not require maintenance or repair during the life of the facility. Equipment located in the hot cell and the filter cave is designed to allow remote removal, decontamination, and replacement. In addition, certain hot cell and filter cave process systems include installed spare components to improve the overall availability of the facility. Items of equipment located in process bulges that require repair and replacement are designed and shielded to allow maintenance access.

The PTF contains 61 DWP-regulated tanks with the majority (58) located on the 0-ft elevation level. Thirty-six DWP-regulated tanks are located in black cell rooms on 0-ft elevation level (P-0102, P-0102A, P-0104, P-0106, P-0108, P-0108A/B/C, P-0109, P-0111, P-0112, P-0114, P-0117, and P-0117A), 15 are located in the central hot cell area (P-0123) or the maintenance cave (P-0123A), and 5 are located in accessible rooms (P-0105B, P-0118, P-0119). Two tanks are located outside and northeast of the main PTF building in an accessible bermed area (P-0150). The remaining three DWP-regulated tanks are located in below grade rooms on the -19-ft elevation level (P-B005) and the -45-ft elevation level (P-B002 and P-B003). The PTF contains 56 DWP-regulated miscellaneous units: five units located in black cell rooms (P-0104, P-0106, P-0112, and P-0117); four units located in the central hot cell (P-0123); 15 units located in the filter cave (P-0335) and 18 units located in other rooms on the 56-ft elevation level (P-0302, P-0304, P-0320, P-0324, P-0325, P-0326, and P-0328); and 14 units located in rooms on the 77-ft elevation level (P-0430, P-0431A, P-0433).

The primary equipment and materials for the PTF separation and conversion processes that prepare the untreated waste for transfer to and immobilization at the LAW vitrification and HLW vitrification facilities are located on the 0-ft elevation level including the waste feed evaporation process system (FEP), the ultrafiltration process system (UFP), the HLW lag storage and feed blending process system (HLP), the cesium ion exchange (IX) process system (CXP), the treated LAW evaporation process system (TLP), and the treated LAW concentrate storage process system (TCP). Some of the equipment and materials for the pretreatment support systems are also located on the 0-ft elevation level including the waste feed receipt process system (FRP), the cesium nitric acid recovery process system (CNP), the spent resin collection and dewatering process system (RDP), the plant wash and disposal system (PWD), the radioactive liquid waste disposal system (RLD), the pulse jet ventilation system (PJV), the pretreatment vessel vent process system (PVP), and the pretreatment in-cell handling system (PIH).

Rooms on the 56-ft elevation and 77-ft elevation levels contain support equipment and processes for the pretreatment operations that are accessible during the life of the facility including miscellaneous units and ancillary equipment associated with the CNP, FEP, and TLP; and most of the equipment associated with the PJV, PVP, and the process vessel vent exhaust system (PVV). The -45-ft elevation level contains inter-facility transfer line tunnels and PWD tank pits.

A detailed description of the design and process features that determine the integrity assessment program and schedule for DWP-regulated equipment in the PTF is presented in Section 4.

3.2 HLW Vitrification Facility

The HLW vitrification facility is a six-story, steel frame and reinforced concrete structure. The facility has dimensions consisting of an approximate 440-ft length, 275-ft width, and 95-ft height, with several below-grade areas at different elevations down to a 31-ft below ground level. The HLW vitrification facility is a mixed-use occupancy building that houses the vitrification system for production of the immobilized HLW. The radioactive material processing and vitrification areas are contained in concrete structures ("cells" and "caves") near the center of the facility. These processing areas are connected by transfer tunnels and shielded doors designed to shield workers from direct radiation exposure during normal, abnormal, and accident conditions.

In the HLW vitrification facility, there are two melters housed inside caves. The two melter caves are identical, shielded concrete enclosures that are of an approximate 75-ft length, 33-ft width, and 55-ft

height. The HLW vitrification facility's production rate is approximately 6 metric tons of glass per day (MTG/day), with each melter having a design capacity of 3 MTG/day.

The HLW concentrate receipt process system (HCP) delivers HLW concentrate through a coaxial pipeline from the PTF to the HLW vitrification facility. Once inside the facility, piping delivers the concentrate to the HLW melter feed process system (HFP), which includes the melter feed preparation vessels (MFPVs) and melter feed vessels (MFVs). HLW concentrate is delivered to the MFPVs, where it is sampled and analyzed to determine the type of glass formers that need to be added. The HLW concentrate and glass formers are blended to create the feed slurry, transferred to the MFVs, and fed to the melters.

The melters in the HLW melter process system (HMP) convert the blended slurry into molten glass. The glass is poured into cylindrical stainless steel canisters, allowed to cool, and sealed. These canisters have 2-ft diameters, 14.5-ft heights, and weigh more than 4 tons. The sealed canisters are transported to the HLW canister decontamination handling system (HDH) where canister surface contamination is removed. The canisters are then transported to the canister storage cave. In full operation, the HLW vitrification facility can annually produce an average of 480 canisters.

The HLW melter offgas treatment process system (HOP) cools and treats the offgas from the melters so that it meets release criteria for radioactive and chemical material. Additionally, the facility structure, with the ventilation systems in the PJV and PVV, provides secondary confinement of airborne releases. The ventilation system supports confinement of airborne contamination within the building by directing the flow of air from areas of less contamination potential to areas of greater contamination potential. The ventilation system also filters the building exhaust air to meet discharge limits.

The process and operational activities described above, plus the HLW melter cave support handling system (HSH) activities in the HLW vitrification facility generate liquid waste effluents. The RLD receives liquid waste, provides interim storage, and transfers the effluent to the PTF for treatment, recycling, or disposal.

A detailed description of the design and process features that determine the integrity assessment program and schedule for DWP-regulated equipment in the HLW vitrification facility is presented in Section 5.

3.3 Balance of Facility

There are 21 underground transfer lines carrying dangerous waste that are connected to, or are within, the WTP facilities. These lines range from 289-ft to 1,078-ft lengths. The transfer lines are double-walled and sloped with low-point leak detection systems.

The PTF receives LAW and HLW feeds from the DOE Tank Farms through three transfer lines. The PTF pretreats the feeds and transfers them to the LAW vitrification facility through three transfer lines or to the HLW vitrification facility through four transfer lines.

Secondary waste from the LAW vitrification facility is returned to the PTF for treatment and disposal through four transfer lines. Secondary waste from the HLW vitrification facility is returned to the PTF through four transfer lines. Secondary waste from the analytical laboratory is transferred to the PTF for treatment and disposal through one transfer line. Secondary waste generated within the PTF is transferred through two transfer lines to the Liquid Effluent Retention Facility (LERF)/Effluent Treatment Facility (ETF).

A detailed description of the design and process features that determine the integrity assessment program and schedule for the underground transfer lines is presented in Section 6.

4 Pretreatment Facility

This section provides detailed descriptions of the PTF DWP-regulated tank systems and miscellaneous unit systems. The tanks, miscellaneous units, breakpots, bulges, sumps, and piping associated with these systems are assessed periodically to confirm the integrity of their materials of construction. The WTP design incorporates the "black cell" and "hard-to-reach area" concept as a key part of the facility design for the PTF and HLW vitrification facility. For black cells, this entails locating certain equipment in shielded cells for which no maintenance or entry is planned for the 40-year design life of the plant. Hard-to-reach areas are designed for no equipment access and maintenance.

The systems in the PTF that contain DWP-regulated tanks and miscellaneous units are as follows:

- waste feed receipt process
- waste feed evaporation process
- ultrafiltration process
- HLW lag storage and feed blending process
- cesium ion exchange process
- cesium nitric acid recovery process
- treated LAW evaporation process
- treated LAW concentrate storage process
- spent resin collection and dewatering process
- pretreatment vessel vent process
- process vessel vent exhaust
- pulse jet ventilation
- pretreatment in-cell handling
- plant wash and disposal
- radioactive liquid waste disposal

For each tank, miscellaneous unit, breakpot, bulge, and sump in the PTF, and associated piping, information is provided on the location of the equipment, its purpose, and its design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for each item of equipment and the characteristics of the waste managed in each tank, miscellaneous unit, breakpot, bulge, sump, and associated piping are also provided. This information is the unit-specific baseline used to establish the approach and schedule for future integrity assessments for the PTF DWP-regulated equipment.

4.1 Waste Feed Receipt Process System

The FRP receives and stores waste (both LAW and HLW) from the DOE Tank Farms and, if needed, transfers waste back to the tank farms. The FRP is housed on the 0-ft elevation level primarily in black cells P-0108 and P-0108A/B/C in the western portion of the PTF building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

4.1.1 Waste Feed Receipt Vessels (FRP-VSL-00002A/B/C/D)

The four waste feed receipt vessels (FRP-VSL-00002A/B/C/D) associated with this system are each located in separate rooms (P-0108, P-0108A, P-0108B, and P-0108C) that are each equipped with stainless steel liners, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD system. Each of the four rooms has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The four waste feed receipt vessels are primarily used to receive waste feed and transfer the waste to either the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) or the waste feed evaporator feed vessels (FEP-VSL-00017A/B). Each tank is designed to receive untreated waste feed from the tank farms and can also receive infrequent transfers from the HLW Feed Receipt Vessel (HLP-VSL-00022) or the FEP (FEP-VSL-00017A/B, FEP-SEP-00001A/B). Each FRP vessel is equipped with remote sampling capability. HLW waste is received from tank farms through HLP-VSL-00022, and if the waste specification is not per WTP waste criteria then the diluted HLW waste is sent only to the FRP-VSL-00002A and then sent back to tank farms thru the FRP pumping system. This is an off-normal case and the connection from HLP-VSL-00022 to FRP-VSL-00002A is through a ridgid jumper that is normally not installed. The maximum capacity of each receipt vessel is 474,000 gallons.

FRP ancillary equipment associated with the waste feed receipt vessels includes the following:

- twelve PJMs for each tank (FRP-PJM-00061 through 00072; FRP-PJM-00017 through 00028; FRP-PJM-00001 through 00004 and FRP-PJM-00029 through 00036; FRP-PJM-00005 through 00016)
- twelve jet pump pairs for each tank (FRP-EJCTR-00002 through 00013; FRP-EJCTR-00024 through 00035; FRP-EJCTR-00046 through 00057; FRP-EJCTR-00068 through 00078 and FRP-EJCTR-00138)
- two transfer pumps (FRP-PMP-00001 and FRP-PMP-00002A)

The PJMs are used for mixing to maintain a uniform concentration of solids for waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

FRP tank ancillary equipment includes two pumps located in the adjacent hot cell (room P-0123): a waste feed return pump (FRP-PMP-00001) used to return off-spec waste feed to the tank farms through one of the three transfer pipelines; and a transfer pump (FRP-PMP-00002A) used to transfer waste feed to FEP-VSL-00017A/B or UFP-VSL-00001A/B. The design flow rate is 100 gallons per minute.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.1.1.1 Design Standards

The waste feed receipt vessels (FRP-VSL-00002A/B/C/D) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The FRP vessels have ASME flanged and dished heads with an approximate 47-ft inside diameter and a 26-ft, 10-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), 1.1875-inch minimum ASME code flanged and dished head (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.044-inch localized protection required for the bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The FRP vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using FRP-PMP-00002A and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

Piping in the transfer lines that convey dangerous waste from the tank farms to the FRP vessels is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a leak detection box (LDB) located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00001 through PWD-LDB-00003).

4.1.1.2 Characteristics of the Waste

The PTF process is for receipt, separation, and conversion of the liquid portion of tank farm wastes (designated Envelopes A, B, C, and D). The wastes are grouped into envelopes based on liquids (Envelopes A, B, and C) versus solids (Envelope D). The liquid wastes are grouped by the waste characteristics: Envelope A wastes are low sulfate wastes and make up the bulk of the waste tanks, Envelope B includes high sulfate wastes, and Envelope C includes high organic wastes (24590-WTP-DB-ENG-01-001, *Basis of Design*). The contents of the FRP vessels are the untreated LAW or HLW waste feed from the tank farms.

The FRP vessels receive LAW waste feed from the tank farms that is approximately 63.7 weight percent (wt%) water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010). The FRP vessels receive HLW waste feed from the tank farms that is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids (24590-WTP-M4C-V11T-00010). The pH of the contents of the FRP vessels is expected to be 13.8 (24590-PTF-N1D-FRP-P0001).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the FRP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FRP vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.2 Waste Feed Evaporation Process System

The FEP receives, blends, and concentrates waste feed and plant recycles. The FEP includes feed vessels; reboilers, separators, and condensers for waste feed evaporation; and a condensate collection vessel. The FEP DWP-regulated units are housed primarily on the 0-ft elevation level in black cell P-0106, the central hot cell (P-0123), and a process bulge area (P-0105B) in the central portion of the PTF and on the 56-ft level in the waste feed evaporator condenser process area (P-0304) building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

4.2.1 Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B)

The two waste feed evaporator feed vessels (FEP-VSL-00017A/B) associated with this system are located in the feed evaporator/ultrafiltration black cell (P-0106), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two waste feed evaporator feed vessels (FEP-VSL-00017A/B) receive waste feed and waste recycles. Waste feed is transferred from the waste feed receipt vessels (FRP-VSL-00002A/B/C/D). Recycles are routed from the plant wash and disposal vessel (PWD-VSL-00044), acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016), spent resin collection and dewatering process vessels (RDP-VSL-00002A/B/C), and ultrafiltration feed preparation vessels (UFP-VSL-00001A/B). Each feed vessel is equipped with remote sampling capability. The maximum capacity of each receipt vessel is 85,496 gallons.

FEP ancillary equipment associated with the waste feed evaporator vessels includes the following:

- eight PJMs for each tank (FEP-PJM-00001 through 00007 and FEP-PJM-00017; FEP-PJM-00008 through 00015)
- eight jet pump pairs for each tank (FEP-EJCTR-00009 through 00011, FEP-EJCTR-00016 through 00019, and FEP-EJCTR-00039; FEP-EJCTR-00022 through 00024, FEP-EJCTR-00028 through 00031, and FEP-EJCTR-00038)
- two transfer pumps (FEP-PMP-00007A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. FEP vessel ancillary equipment includes two feed pumps (FEP-PMP-00007A/B) located in the adjacent hot cell (room P-0123).

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.2.1.1 Design Standards

The waste feed evaporator feed vessels (FEP-VSL-00017A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The FEP feed vessels have ASME 2:1 semi-elliptical heads with an approximate 22-ft inside diameter and a 37-ft, 1-inch tangent to tangent length. The tank thicknesses are 1.00-inch (shell) and 0.75-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.094-inch localized protection required for the bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The FEP waste feed evaporator feed vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the feed pumps (FEP-PMP-00007A/B) and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.2.1.2 Characteristics of the Waste

The FEP waste feed evaporator feed vessels receive LAW feed that is approximately 63.7 wt% water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0002). The FEP feed vessels may also receive:

- HLW from the HLW feed receipt vessel (HLP-VSL-00022) that is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13.0
- Waste feed concentrate recycle from the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) that is 67.2 wt% water, 29.0 wt% dissolved solids, and 3.81 wt% solids with a pH of 14.0
- Plant waste effluent from the plant wash vessel (PWD-VSL-00044)
- Neutralized high-activity effluent from the acidic/alkaline effluent vessels (PWD-VSL-00015 and 00016)
- Spent flush liquor from the spent resin slurry vessels (RDP-VSL-00002A/B/C)

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the FEP. Assessment for these tanks located in black cells is limited to remote monitoring

with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FEP vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.2.2 Waste Feed Evaporator Condensate Vessel (FEP-VSL-00005)

The waste feed evaporator condensate vessel (FEP-VSL-00005) associated with this system is located in a process (bulge) area (P-0105B), which is equipped with a special protective coating (SPC) as specified by *Field Applied Special Protective Coatings for Secondary Containment Areas* (24590-WTP-3PS-AFPS-TP006) and floor drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. The SPC covers the room floor and perimeter curbing up to the maximum height to contain the total volume of the tank plus 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

FEP ancillary equipment associated with the waste feed evaporator condensate vessel includes two recirculation pumps (FEP-PMP-00006A/B). The waste feed evaporator condensate vessel (FEP-VSL-00005) receives condensate by gravity drain from the waste feed evaporator primary condenser. As the condensate vessel fills, the waste feed evaporator condensate pumps (FEP-PMP-00006A/B) recirculate condensate continuously back to the tank with a portion recycled to the separator vessel for spraying the demister pads. The maximum capacity of the tank is 5,002 gallons.

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.2.2.1 Design Standards

The waste feed evaporator condensate vessel (FEP-VSL-00005) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The FEP waste feed evaporator condensate vessel is vendor designed with an approximate 8-ft inside diameter and a 10-ft, 8-inch total length. The tank thickness is 0.250-inch minimum. Thickness includes the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.2.2.2 Characteristics of the Waste

The FEP waste feed evaporator condensate vessel receives condensate that is 100 wt% water with a pH of approximately 10 to 11 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0003).

The materials of construction for this tank are compatible with the waste managed. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.2.3 Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B)

The waste feed evaporator separator vessels (FEP-SEP-00001A/B) associated with this system are miscellaneous units located in the feed evaporator/ultrafiltration black cell (P-0106), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two evaporator separators are each part of an evaporator train that concentrates waste to provide optimum conditions for waste processing via ultrafiltration and IX. Each waste feed evaporator separator vessel is equipped with an external concentrate pump (FEP-PMP-00008A/B) to transfer concentrate from the separator to the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B).

The separators and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life.

4.2.3.1 Design Standards

The waste feed evaporator separator vessels (FEP-SEP-00001A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The evaporator separators are vendor designed with an approximate 7-ft, 6-inch inside diameter (upper portion) and 11-ft, 5-inch diameter (lower portion) and an approximate 34-ft total length. The shell thickness is 0.500-inch minimum. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The evaporator separators form part of a forced-circulation evaporator configuration that is composed of common primary equipment sizes for the separators, plus recirculation pumps (FEP-PMP-00008A/B and FEP-PMP-00009A/B), reboilers (FEP-RBLR-00001A/B), and condensers (FEP-COND-00001A/B, FEP-COND-00002A/B, and FEP-COND-00003A/B).

4.2.3.2 Characteristics of the Waste

The FEP waste feed evaporator separator vessels receive LAW and recycled feed that is approximately 77.5 wt% water, 21.8 wt% dissolved solids, and 0.59 wt% solids with a pH of approximately 13.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0007).

The materials of construction for the FEP evaporator separators and ancillary equipment are compatible with the waste managed in the FEP. Assessment for these miscellaneous units located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FEP evaporator separators are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the separators.

4.2.4 Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B)

The waste feed evaporator reboilers (FEP-RBLR-00001A/B) associated with this system are miscellaneous units located in the central hot cell (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The two evaporator reboilers are each part of an evaporator train that concentrates waste to provide optimum conditions for waste processing via ultrafiltration and IX. Each waste feed evaporator reboiler is equipped with an external recirculation pump (FEP-PMP-00009A/B).

The reboiler shells and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life. Tubes on the reboilers are made of Hastelloy G-30 Alloy (UNS N06030) or equivalent.

4.2.4.1 Design Standards

The waste feed evaporator reboilers (FEP-RBLR-00001A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The evaporator reboilers are vendor designed with a 6-ft inside diameter and a 15-ft length. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The evaporator reboilers form part of a forced-circulation evaporator configuration that is composed of common primary equipment sizes for the reboiler separator vessels, plus separators (FEP-SEP-00001A/B), recirculation pumps (FEP-PMP-00008A/B and FEP-PMP-00009A/B), and condensers (FEP-COND-00001A/B, FEP-COND-00002A/B, and FEP-COND-00003A/B).

4.2.4.2 Characteristics of the Waste

The FEP evaporator reboilers receive LAW and recycled feed that is approximately 77.5 wt% water, 21.8 wt% dissolved solids, and 0.59 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-FEP-P0008).

The materials of construction for the FEP evaporator reboilers and ancillary equipment are compatible with the waste managed in the FEP. Assessment for these miscellaneous units located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the FEP evaporator reboilers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the reboilers.

4.2.5 Waste Feed Evaporator Primary Condensers (FEP-COND-00001A/B), Intercondensers (FEP-COND-00002A/B), and Aftercondensers (FEP-COND-00003A/B)

The waste feed evaporator primary condensers (FEP-COND-00001A/B), intercondensers (FEP-COND-00002A/B), and aftercondensers (FEP-COND-00003A/B) associated with this system are miscellaneous units located in the waste feed evaporator condenser process area (P-0304), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

FEP ancillary equipment associated with the waste feed evaporator condensers includes four ejectors (FEP-EJCTR-00040 through 00043). The evaporator condensers are part of an evaporator train that concentrates waste to provide optimum conditions for waste processing via ultrafiltration and IX. De-entrained water vapor and gases enter the waste feed evaporator primary condensers, where condensable vapors are removed by condensation and discharged by gravity drain to the FEP evaporator condensate vessel (FEP-VSL-00005). Two ejectors (per evaporator train) generate the vacuum requirements that enable boiling at approximately 122°F. The first ejector (FEP-EJCTR-00040 or 00042) discharges steam and noncondensable gases to the waste feed evaporator intercondenser to condense steam from the ejector. The second ejector (FEP-EJCTR-00041 or 00043) draws noncondensable gases from the intercondenser and discharges steam and noncondensable gases to the aftercondenser to condense the ejector steam. The condensate from each of the condensers drains to the FEP evaporator condensate vessel.

The condensers and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the condensate for a 40-year life.

4.2.5.1 Design Standards

The waste feed condensers (FEP-COND-00001A/B, FEP-COND-00002A/B, and FEP-COND-00003A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The evaporator condensers are vendor designed. The nominal dimensions of the primary condensers include a 4-ft, 2-inch inside diameter and a 23-ft length. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The evaporator condensers form part of a forced-circulation evaporator configuration that is composed of common primary equipment sizes for the condensers, plus separators (FEP-SEP-00001A/B), recirculation pumps (FEP-PMP-00008A/B and FEP-PMP-00009A/B), and reboilers (FEP-RBLR-00001A/B).

4.2.5.2 Characteristics of the Waste

The FEP condensers receive water vapor and gases (24590-PTF-3YD-FEP-00001). The materials of construction for these units are compatible with the waste managed. The schedule for conducting periodic assessments of these units is provided in Table 7. For the purpose of scheduling periodic assessments, these units are considered to have a lower potential for corrosion and erosion on the basis of

the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the units.

4.3 Ultrafiltration Process System

The UFP removes entrained solids and strontium (Sr) and transuranic (TRU) elements from a combined HLW and LAW feed that meets certain envelope definitions. Depending on the feed envelope, different levels of treatment will be required. Envelopes A/D and B/D will require only entrained solids removal, while Envelope C feed will require both entrained solids and Sr/TRU removal. The UFP includes feed preparation vessels, feed vessels, permeate vessels, pumps, pulsepots, breakpots, ejectors, and ultrafilters. The UFP DWP-regulated units are housed primarily on the 0-ft elevation level in black cells (P-0104 and P-0106) and the central hot cell (P-0123) in the central portion of the PTF. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

4.3.1 Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B) and Breakpot (UFP-BRKPT-00001B)

The two ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) associated with this system are located in the feed evaporator/ultrafiltration black cell (P-0106) and the ultrafiltration black cell (P-0104), respectively, which are each equipped with a stainless steel liner, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. These rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

Two UFP feed preparation vessels (UFP-VSL-00001A/B) receive LAW feed from the FRP (FRP-VSL-00002A/B/C/D), HLW feed from the HLP (HLP-VSL-00022), and evaporator concentrate from the FEP (FEP-SEP-00001A/B). Each feed preparation vessel is equipped with remote sampling capability. The maximum capacity of each tank is 75,593 gallons.

UFP ancillary equipment that is associated with the ultrafiltration feed preparation vessels includes the following:

- one breakpot (UFP-BRKPT-00001B), with a total volume of 175 gallons
- eight PJMs for each tank (UFP-PJM-00001 through 00004, UFP-PJM-00044, UFP-PJM-00053, UFP-PJM-00105, and UFP-PJM-00106; UFP-PJM-00045 through 00050, UFP-PJM-00101, and UFP-PJM-00102)
- eight jet pump pairs for each tank (UFP-EJCTR-00041 through 00042, UFP-EJCTR-00044, UFP-EJCTR-00134, UFP-EJCTR-00152, UFP-EJCTR-00180 through 00181, and UFP-EJCTR-00186; UFP-EJCTR-00140 through 00145, and UFP-EJCTR-00169 through 00170)
- vessel-emptying ejectors (UFP-EJCTR-00019A and UFP-EJCTR-00020A)
- two transfer pumps (UFP-PMP-00041A/B)
- two heat exchangers (UFP-HX-00041A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

The UFP vessel concentrate transfer pumps (UFP-PMP-00041A/B) and slurry coolers (UFP-HX-00041A/B) are located in the adjacent hot cell (room P-0123); the breakpot (UFP-BRKPT-00001B) and steam heating vessel-emptying ejectors (UFP-EJCTR-00019A and UFP-EJCTR-00020A) are located in the black cell. The breakpot, located at the 28-ft elevation level in black cell P-0104, receives ultrafiltration recycle from the treated ultrafiltration feed vessels (UFP-VSL-00002A/B), which drains by gravity to the UFP feed preparation vessels.

The tanks, breakpot, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. Steam ejector/high temperature components located inside the tanks are made of Alloy C-22 (UNS N06022).

4.3.1.1 Design Standards

The UFP feed preparation vessels (UFP-VSL-00001A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP feed preparation vessels have ASME 2:1 ellipsoidal heads with an approximate 14-ft inside diameter and a 30-ft, 9-inch tangent to tangent length. The tank thicknesses are 1.375-inches (shell) and 0.750-inch minimum head (top) and 1.070-inch minimum head (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for these tanks), plus additional 0.129-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The UFP feed preparation vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- steam sparge rings
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00041A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.3.1.2 Characteristics of the Waste

The UFP feed preparation vessels receive LAW feed from the FRP (FRP-VSL-00002A/B/C/D), HLW feed from the HLP (HLP-VSL-00022), and evaporator concentrate from the FEP (FEP-SEP-00001A/B). LAW feed is approximately 77.5 wt% water, 21.8 wt% dissolved solids, and 0.59 wt% solids (24590-WTP-M4C-V11T-00010). HLW feed is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids (24590-WTP-M4C-V11T-00010). Evaporator concentrate is approximately 66 wt% water, 33 wt% dissolved solids, and 0.089 wt% solids (24590-WTP-M4C-V11T-00010). The waste

streams received by UFP-VSL-00001A/B have pH ranging from approximately 12.0 to 14.0 (24590-PTF-N1D-UFP-P0005).

The materials of construction for the UFP feed preparation vessels, breakpots, and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.3.2 Ultrafiltration Feed Vessels (UFP-VSL-00002A/B)

The two ultrafiltration feed vessels (UFP-VSL-00002A/B) associated with this system are located in the ultrafiltration black cell (P-0104), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two feed vessels (UFP-VSL-00002A/B) are used to perform solids washing (with process condensate); caustic leaching (with 19 molar sodium hydroxide) of the concentrated solids; and chemical cleaning of the filters through nitric acid (2 molar nitric acid) and caustic (0.1 molar sodium hydroxide) additions. Additional capabilities to perform oxidative leaching have been provided for these tanks. Each feed vessel is equipped with remote sampling capability. The maximum capacity of each receipt vessel is 40,783 gallons.

UFP ancillary equipment associated with the ultrafiltration feed vessels includes the following:

- four recirculation pumps (UFP-PMP-00042A/B and UFP-PMP-00043A/B)
- six PJMs for each tank (UFP-PJM-00006 through 00011; UFP-PJM-00012 through 00017)
- six jet pump pairs for each tank (UFP-EJCTR-00048 through 00051, UFP-EJCTR-00053, and UFP-EJCTR-00062; UFP-EJCTR-00055 through 00058 and UFP-EJCTR-00060 through 00061)
- two transfer pumps (UFP-PMP-00044A/B)
- two heat exchangers (UFP-HX-00001A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Ultrafiltration feed vessel ancillary equipment includes recirculation pumps (UFP-PMP-00042A/B and UFP-PMP-00043A/B), two transfer pumps (UFP-PMP-00044A/B), and slurry coolers (UFP-HX-00001A/B) located in the adjacent hot cell (room P-0123).

The tanks, heat exchangers, and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life. Steam ejector/high temperature components located inside the tanks are made of Alloy C-22 (UNS N06022).

4.3.2.1 Design Standards

The UFP feed vessels (UFP-VSL-00002A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP feed vessels have ASME 2:1 elliptical heads with an approximate 14-ft inside diameter of and a 30-ft, 9-inch tangent to tangent length. The tank thicknesses are 1.875-inches (shell upper course), 1.250-inches (shell lower course), and 0.625-inch minimum head (top) and 0.875-inch minimum head (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.517-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The UFP feed vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- steam sparge rings
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00042A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.3.2.2 Characteristics of the Waste

The UFP feed vessels receive waste feed from the UFP feed preparation vessels (UFP-VSL-00001A/B) and cleaning reagents (sodium hydroxide and nitric acid). UFP feed is approximately 67.2 wt% water, 29 wt% dissolved solids, and 3.8 wt% solids with a pH of 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-UFP-P0003).

The materials of construction for the UFP feed vessels and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.3.3 Ultrafilters (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, UFP-FILT-00005A/B)

The ultrafilters (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, UFP-FILT-00005A/B) associated with this system (vessels and equipment) are tanks located in the hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment

for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The ultrafilter tube units (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B) separate solids from the liquid fraction, and concentrate the solids slurry to approximately 20 wt% solids. The maximum capacity of each ultrafilter is 140 gallons.

UFP ancillary equipment associated with each ultrafilter tube unit consists of a pulsepot (UFP-PP-00001A/B, UFP-PP-00002A/B, UFP-PP-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B). The pulsepots provide for back-pulsing on the ultrafilter tube units, which may involve adding cleaning chemicals (2 molar nitric acid, 2 molar sodium hydroxide, and process condensate), and are located in the hot cell.

The ultrafilter units and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. Pulse-posts have all welded construction and are made of stainless steel 304L (UNS S30403).

4.3.3.1 Design Standards

The UFP ultrafilter tube units (UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP ultrafilter units are vendor designed with an approximate 16.75-ft diameter. The tank thicknesses include the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.3.3.2 Characteristics of the Waste

The UFP ultrafilters receive waste feed from the UFP feed vessels (UFP-VSL-00002A/B) and pulsepots receive waste feed and cleaning reagents (sodium hydroxide and nitric acid). UFP feed is approximately 67.2 wt% water, 29 wt% dissolved solids, and 3.8 wt% solids with a pH of 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-UFP-P0004).

The materials of construction for the UFP ultrafilters and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP ultrafilters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.3.4 Ultrafilter Permeate Vessels (UFP-VSL-00062A/B/C)

The three ultrafiltration permeate vessels (UFP-VSL-00062A/B and UFP-VSL-00062C) associated with this system are located in the feed evaporator/ultrafiltration black cell (P-0106) and the ultrafiltration

black cell (P-0104), respectively, which are each equipped with a stainless steel liner, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. These rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The three permeate vessels (UFP-VSL-00062A/B/C) receive process condensate for dilution of permeate prior to transfer to the cesium IX vessel (CXP-VSL-00001) via RFDs (UFP-RFD-00033, UFP-RFD-00038, and UFP-RFD-00044). Each permeate vessel is equipped with remote sampling capability. The maximum capacity of each receipt vessel is 34,700 gallons.

UFP ancillary equipment associated with the ultrafilter permeate vessels includes the following:

- six PJMs for each tank (UFP-PJM-00018 through 00022 and UFP-PJM-00052; UFP-PJM-00039 through 00043 and UFP-PJM-00051; UFP-PJM-00070, UFP-PJM-00073, UFP-PJM-00076 through 00078, and UFP-PJM-00107)
- six jet pump pairs for each tank (UFP-EJCTR-00066 through 00070 and UFP-EJCTR-00150; UFP-EJCTR-00086 through 00089, UFP-EJCTR-00149, and UFP-EJCTR-000159; UFP-EJCTR-00023 through 00024, UFP-EJCTR-00028 through 00029, and UFP-EJCTR-00182 through 00183)
- six charge vessels for each tank (UFP-VSL-00032 through 00034, UFP-VSL-00072 through 00073, and UFP-VSL-00082; UFP-VSL-00035 through 00037, UFP-VSL-00051, UFP-VSL-00075, and UFP-VSL-00083; UFP-VSL-00023 through 00025, UFP-VSL-00069 through 00070, and UFP-VSL-00084)
- six RFDs for each tank (UFP-RFD-00027 through 00028, UFP-RFD-00030, UFP-RFD-00037 through 00038, and UFP-RFD-00049; UFP-RFD-00031 through 00034, UFP-RFD-00039, and UFP-RFD-00047; UFP-RFD-00042 through 00046 UFP-RFD-00048)
- six RFD ejectors for each tank (UFP-EJCTR-00063 through 00064, UFP-EJCTR-00075, UFP-EJCTR-00077, UFP-EJCTR-00079, and UFP-EJCTR-00174; UFP-EJCTR-00006, UFP-EJCTR-00030, UFP-EJCTR-00043, UFP-EJCTR-00167 through 000168, and UFP-EJCTR-000173; UFP-EJCTR-00025 through 00027, UFP-EJCTR-00033, UFP-EJCTR-00166, and UFP-EJCTR-00177)
- three vessel-emptying ejectors (UFP-EJCTR-00073, UFP-EJCTR-00094, and UFP-EJCTR-00013) (these ejectors will not normally be installed)

The PJMs are used for mixing to maintain a uniform concentration of solids for waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a pump jet pump located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer permeate to the CXP, or to transfer waste to the UFP feed preparation vessels (UFP-VSL-00001A/B) or to the PWD or autosampling system (ASX). Each RFD is connected to an ejector located outside the tank. The vessel-emptying ejectors, located external to the tank, are used to empty the tanks and may also be used to facilitate waste transfers.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.3.4.1 Design Standards

The UFP permeate vessels (UFP-VSL-00062A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The UFP permeate vessels have ASME 2:1 ellipsoidal heads with an approximate 15-ft inside diameter and a 21-ft, 3-inch tangent to tangent length. The tank thicknesses are 0.875-inch (shell) and 0.5625-inch minimum head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The UFP permeate vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.3.4.2 Characteristics of the Waste

The UFP permeate vessels receive permeate and solids wash from the UFP feed vessels (UFP-VSL-00002A/B). UFP permeate and solids wash is approximately 69.9 wt% water, 30.1 wt% dissolved solids, and 0.0 wt% solids with a pH of 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-UFP-P0008).

The materials of construction for the UFP ultrafilter permeate vessels and ancillary equipment are compatible with the waste managed in the UFP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP permeate vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.3.5 UFP Bulges (UFP-BULGE-00001, UFP-BULGE-00002, UFP-BULGE-00005, and UFP-BULGE-00006)

The two reagent and process air valve bulges associated with the UFP (UFP-BULGE-00001 and UFP-BULGE-00002) are located adjacent to the filter cave on the 56-ft elevation level in room P-0301. The valve bulges for the UFP provide secondary containment away from the black cells and hot cell,

where the control valves and valve actuators are accessible for maintenance. Room P-0301 has a radiological area classification of R3/C3 (Table 6).

The two ultrafiltration utility bulges associated with the UFP (UFP-BULGE-00005 and UFP-BULGE-00006) are located on the 56-ft elevation level in rooms P-0311 and P-0311A. The utility bulges for the UFP provide secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Rooms P-0311 and P-0311A have a radiological area classification of R3/C3 (Table 6).

The bulges and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the reagents and process condensate for a 40-year life.

4.3.5.1 Design Standards

The UFP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge confinement for UFP-BULGE-00001 and UFP-BULGE-00002 is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. Bulge confinement for UFP-BULGE-00005 and UFP-BULGE-00006 is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities. The associated UFP process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.3.5.2 Characteristics of the Waste

The UFP reagent and process air bulges (UFP-BULGE-00001 and UFP-BULGE-00002) cycle plant air, reagents (sodium hydroxide or nitric acid), and process condensate to the UFP pulsepots (UFP-PP-00001A/B, UFP-PP-00002A/B, and UFP-PP-00003A/B). The UFP utility bulges (UFP-BULGE-00005 and UFP-BULGE-00006) cycle process condensate through the UFP recirculation loop. The process condensate, which is received from the process condensate tanks (RLD-TK-00006A/B), is 100 wt% water with a pH of 11.5 (24590-WTP-M4C-V11T-00010).

The materials of construction for bulges are compatible with the waste managed in the UFP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the UFP bulges are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

4.4 HLW Lag Storage and Feed Blending Process System

The HLP receives and stores HLW waste from the tank farm, receives and stages HLW intermediate products (i.e., treated solids and Sr/TRU precipitates), blends HLW intermediate products and cesium concentrate prior to transfer to the HLW vitrification facility and, if needed, transfers waste and treated solids back to the tank farms. The HLP is housed on the 0-ft elevation level primarily in black cells P-0102 and P-0102A adjacent to the southeastern margin of the central hot cell area in the PTF building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

4.4.1 HLW Feed Receipt Vessel (HLP-VSL-00022)

The HLW feed receipt vessel (HLP-VSL-00022) associated with this system is located in the HLW receipt and blending black cell (P-0102A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The HLW feed receipt vessel receives waste feed from the tank farm. Received waste is sampled prior to transfer for processing. Depending on the sampling results, the HLW waste suitable for processing is transferred to either the ultrafiltration feed preparation vessels (UFP-VSL-00001A/B) or the waste feed evaporator feed vessels (FEP-VSL-00017A/B) (Envelopes A and B), or to the waste feed receipt vessels (FRP-VSL-00002A/B/C/D) (Envelopes A/B/C/D) for filtration, evaporation, or blending, respectively. Waste unsuitable for processing is transferred back to the tank farms. The HLW feed receipt vessel is equipped with remote sampling capability. The maximum capacity of the tank is 270,600 gallons.

HLP ancillary equipment associated with the HLW waste feed receipt vessel includes the following:

- twelve PJMs (HLP-PJM-00056 through 00057 and HLP-PJM-00084 through 00093)
- twelve jet pump pairs (HLP-EJCTR-00041 through 00048, HLP-EJCTR-00076 through 00077, and HLP-EJCTR-00087 through 00088)
- one recirculation pump (HLP-PMP-00021)

The PJMs are used for mixing to maintain a uniform concentration of solids for waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The pump (HLP-PMP-00021) located in the adjacent hot cell (room P-0123) provides transfer capabilities to the FEP, FRP, and UFP, or to the tank farm by way of FRP tanks.

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.4.1.1 Design Standards

The HLW feed receipt vessel (HLP-VSL-00022) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The HLW feed receipt vessel has ASME flanged and dished heads with an approximate 38-ft inside diameter of and a 24-ft, 2-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for this tank), plus additional 0.398-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW feed receipt vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00021 and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.4.1.2 Characteristics of the Waste

The HLW feed receipt vessel receives HLW waste feed from the tank farms that is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0003).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HLP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HLW feed receipt vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.4.2 HLW Lag Storage Vessels (HLP-VSL-00027A/B) and Breakpot (HLP-BRKPT-00004)

The two HLW lag storage vessels (HLP-VSL-00027A/B) associated with this system are located in the HLW storage black cell (P-0102), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The two HLW lag storage vessels receive solid slurries that were concentrated in the UFP, such as Sr/TRU precipitate (Envelope C) or treated solids (Envelopes A/D and B/D). These solid slurries are received, segregated, and staged separately in either of the two HLW lag storage vessels. Each HLW lag storage vessel is equipped with remote sampling capability. The maximum capacity of each tank is 127,260 gallons.

HLP ancillary equipment associated with the HLW lag storage vessels includes the following:

- eight PJMs for each tank (HLP-PJM-00060 through 00067 and HLP-PJM-00068 through 00075)

- eight jet pump pairs for each tank (HLP-EJCTR-00001 through 00008 and HLP-EJCTR-00021 through HLP-EJCTR-00028)
- one breakpot (HLP-BRKPT-00004), with a total volume of 92 gallons
- two transfer pumps (HLP-PMP-00017A/B)

The PJMs are used for mixing to maintain a uniform concentration of solids for blended waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

The HLP cesium concentrate receipt breakpot (HLP-BRKPT-00004) is located on the 28-ft elevation level in the black cell. The breakpot receives cesium concentrate from the cesium evaporator (CNP-EVAP-00001) and eluate contingency storage vessel (CNP-VSL-00003), which drains by gravity to the HLW lag storage vessel HLP-VSL-00027B.

The two HLW transfer pumps (HLP-PMP-00017A/B) are located in the adjacent hot cell (room P-0123). Both pumps have the capability to recirculate between and within the two vessels and transfer to the tank farm, while HLP-PMP-00017B associated with vessel HLP-VSL-00027B has the ability to transfer to the HLW vitrification facility. For transfers of off-specification material to the tank farm, HLP-PMP-00017A/B operate in series with the waste feed return pump (FRP-PMP-00001).

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. The breakpot is made of Alloy C-22 (UNS N06022).

4.4.2.1 Design Standards

The HLW lag storage vessels (HLP-VSL-00027A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The HLW lag storage vessels have ASME flanged and dished heads with an approximate 25-ft inside diameter of and a 29-ft, 6-inch tangent to tangent length. The tank thicknesses are 11inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.436-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW lag storage vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00017A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.4.2.2 Characteristics of the Waste

The contents of the HLW lag storage vessels are primarily treated HLW solids, cesium concentrate, and Sr/TRU precipitate solids from the LAW pretreatment process. The HLW wastes include Sr/TRU precipitate slurries and cesium concentrates recovered from LAW pretreatment tanks (UFP-VSL-00002A/B and FEP-SEP-00001B). Vessel HLP-VSL-00027B also receives cesium concentrate from the treated LAW evaporator concentrate vessel (TCP-VSL-00002) and eluate contingency storage vessel (CNP-VSL-00003), which is received by gravity drain from the cesium concentrate receipt breakpot (HLP-BRKPT-00004); and off-specification resin from the spent resin slurry vessels (RDP-VSL-00002A/B/C).

The HLW lag storage vessels contain waste for transfer to the HLW vitrification facility that is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0007).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the HLP. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HLW lag storage vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.4.3 HLW Feed Blending Vessel (HLP-VSL-00028) and Breakpot (HLP-BRKPT-00006)

The HLW feed blending vessel (HLP-VSL-00028) associated with this system is located in the HLW receipt and blending black cell (P-0102A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The HLW feed blending vessel receives treated solids for blending prior to transfer to the HLW vitrification facility for immobilization. The HLW feed blending vessel is equipped with remote sampling capability. The maximum capacity of each tank is 142,200 gallons.

HLP ancillary equipment associated with the HLW feed blending vessel includes the following:

- eight PJMs (HLP-PJM-00076 through 00083)
- eight jet pump pairs (HLP-EJCTR-00031 through 00038)
- one breakpot (HLP-BRKPT-00006), with a total volume of 92 gallons
- two transfer pumps (HLP-PMP-00019A/B)

The PJMs are used for mixing to maintain a uniform concentration of solids for blended waste feed sampling and transfer and to prevent hydrogen accumulation. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell.

The HLP cesium concentrate receipt breakpot (HLP-BRKPT-00006) is located at the 28-ft elevation in the black cell. The breakpot receives cesium concentrate from the CNP evaporator separator (CNP-EVAP-00001), and drains by gravity to the HLW feed blending vessel.

The two HLW melter feed pumps (HLP-PMP-00019A/B), located in the adjacent hot cell (room P-0123), are used primarily for periodic transfer of blended waste to the HLW vitrification feed vessels (HFP-VSL-00001 and HFP-VSL-00005) and to provide recirculation within the feed blending vessel. Additionally, the HLW melter feed pumps are used for transfer to the HLW lag storage vessels or return of off-specification materials to the tank farm via the waste feed return pump (FRP-PMP-00001).

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life. The breakpot is made of Alloy C-22 (UNS N06022).

4.4.3.1 Design Standards

The HLW feed blending vessel (HLP-VSL-00028) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The HLW feed blending vessel has ASME flanged and dished heads with an approximate 26-ft, 6-inch inside diameter of and a 29-ft tangent to tangent length. The tank thicknesses are 1-inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, plus additional 0.434-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW feed blending vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00019A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

Piping in the transfer lines that convey off-specification treated solids from the HLP vessel to the tank farms is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to an LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00004 through PWD-LDB-00007).

4.4.3.2 Characteristics of the Waste

The contents of the HLW feed blending vessel are primarily treated HLW solids, cesium concentrate, and Sr/TRU precipitate solids from the UFP process. The HLW wastes include Sr/TRU precipitate slurries and cesium concentrates recovered from UFP and CNP vessels (UFP-VSL-00002A/B and CNP-EVAP-00001); cesium concentrate from the treated CNP evaporator concentrate vessel (CNP-EVAP-00001) and eluate contingency storage vessel (CNP-VSL-00003), which is received by gravity drain from the cesium concentrate receipt breakpot (HLP-BRKPT-00006); and off-specification resin from the spent resin slurry vessels (RDP-VSL-00002A/B/C). This tank may also receive treated cesium and Sr/TRU slurry from the Hanford cesium and Sr/TRU capsules.

The HLW feed blending vessel contains blended waste for transfer to the HLW vitrification facility that is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0010).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HLP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HLW feed blending vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.5 Cesium Ion Exchange Process System

The CXP removes cesium from filtered process liquor to prepare it for treatment in the LAW vitrification facility melters. Cesium removal is accomplished by treating the LAW feed in an IX system that uses an organic media with a high selectivity and capacity for cesium that can be regenerated and reused. The CXP is housed on the 0-ft elevation level primarily in black cells P-0111 and P-0114 adjacent to the northern margin of the central hot cell area, and in the hot cell (room P-0123) in the PTF building. Some valves and transfer and return pumps are located in the central hot cell for remote maintenance access; some pumps are located in an accessible area (room P-0110C).

4.5.1 Cesium Ion Exchange Feed Vessel (CXP-VSL-00001)

The cesium IX feed vessel (CXP-VSL-00001) associated with this system is located in the cesium IX black cell (P-0111), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The CXP feed vessel receives LAW from ultrafiltration and provides feed buffer capacity to allow continuous operation of the IX system. This tank is also used as a point of recycle for the IX system if the cesium treated LAW is found to be out of specification for cesium (Cs)-137 (137Cs) content. The maximum capacity of the tank is 103,350 gallons.

CXP ancillary equipment associated with the CXP feed vessel includes the following:

- two cesium IX feed coolers (CXP-HX-00001A/B)
- two pumps (CXP-PMP-00001A/B)

The cesium IX feed coolers (CXP-HX-00001A/B) are used to control the temperature of the LAW and reagent feeds to the columns. The cesium IX feed pumps (CXP-PMP-00001A/B) are used to feed LAW, reagents, and water to the IX columns for LAW loading and displacement, and for pre-elution rinse, elution, post-elution rinse, and caustic regeneration.

The tank, ancillary equipment, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.5.1.1 Design Standards

The cesium IX feed vessel (CXP-VSL-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium IX feed vessel has ASME flanged and dished heads with an approximate 23-ft inside diameter and a 26-ft, 6-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX feed vessel includes the following tank internals, which are of a standard design with no moving parts:

- vessel spray nozzles
- level, density, and temperature instrumentation

4.5.1.2 Characteristics of the Waste

The contents of the cesium IX feed vessel are primarily ultrafiltration permeate from the LAW pretreatment process (UFP-VSL-00062A/B/C). This tank is also used as a point of recycle for the IX system if the cesium treated LAW is found to be out of specification for 137Cs content.
The cesium IX feed vessel contains filtered LAW for transfer to the cesium IX columns that is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CXP-P0001).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the CXP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX feed vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.5.2 Cesium Ion Exchange Reagent Vessel (CXP-VSL-00005)

The cesium IX reagent vessel (CXP-VSL-00005) associated with this system is located in the cesium IX black cell (P-0111) at the 56-ft elevation level, which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium IX reagent vessel (CXP-VSL-00005) is designed to receive demineralized water, nominal 0.25 molar sodium hydroxide solution, nominal 0.1 molar sodium hydroxide solution, and standby nitric acid as fresh reagents. In addition, the cesium IX reagent vessel receives recycled spent regeneration caustic solution from the cesium IX caustic rinse collection vessel (CXP-VSL-00004). The maximum capacity of the tank is 1,141 gallons.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the reagents for a 40-year life.

4.5.2.1 Design Standards

The cesium IX reagent vessel (CXP-VSL-00005) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium IX reagent vessel has ASME flanged and dished heads with an approximate 5-ft inside diameter and a 6-ft, 6-inch tangent to tangent length. The tank thicknesses are 0.375-inch (shell) and 0.250-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX reagent vessel includes the following tank internals, which are of a standard design with no moving parts:

- vessel spray nozzles
- level, density, and temperature instrumentation

4.5.2.2 Characteristics of the Waste

The contents of the cesium IX reagent vessel are primarily demineralized water and fresh reagents (nominal 0.025 molar sodium hydroxide, nominal 0.1 molar sodium hydroxide or, under standby conditions, 0.1 molar nitric acid). Tank contents are 98 wt% water and less than 2 wt% solids. Contents have a pH of 13.0 (24590-PTF-N1D-CXP-P0008).

The materials of construction for this tank are compatible with the waste managed in the CXP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX reagent vessel is considered to have a lower potential for corrosion and erosion on the basis

of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.5.3 Cesium Ion Exchange Columns (CXP-IXC-00001 through CXP-IXC-00004)

The cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) associated with this system are miscellaneous units located in the hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The cesium IX columns consist of vessels holding a resin bed to adsorb cesium from treated LAW feed received from the cesium IX feed vessel (CXP-VSL-00001). The cesium IX columns produce a treated LAW of greatly reduced cesium concentration (and therefore reduced gamma radiation). The columns are also designed to desorb the cesium during the elution and regeneration sequences such that the resin bed can be cleaned of cesium to be used in another cycle of loading. The maximum capacity of each tank is 680 gallons.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste for a 40-year life. The IX columns are designed for remote removal and replacement after a design life of 10 years.

4.5.3.1 Design Standards

The cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The cesium IX columns have ASME 2:1 elliptical heads (top and bottom) with an approximate 4-ft inside diameter and a 17-ft, 9-inch tangent to tangent length. The tank thicknesses are 0.5-inch (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for the IX columns . Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.5.3.2 Characteristics of the Waste

The contents of the cesium IX columns are primarily resin and ultrafiltration permeate from the LAW pretreatment process from the cesium IX feed vessel (CXP-VSL-00001). The cesium IX columns also receive demineralized water and reagents (CXP-VSL-00005) for the regeneration of the IX resin.

The cesium IX columns receive filtered LAW that is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH ranging from 0.3 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CXP-00002).

The materials of construction for cesium IX column vessels are compatible with the waste managed in the CXP. Assessment for these tanks that are located in the hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned on a 10-year basis for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX column vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.5.4 Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B/C)

The cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) associated with this system are located in the treated LAW collection black cell (P-0114), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The three cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) receive cesium-depleted filtered LAW prior to transfer to the treated LAW evaporator separator (TLP-SEP-00001). Each collection vessel is equipped with remote sampling capability. The maximum capacity of each tank is 39,000 gallons.

CXP ancillary equipment associated with the cesium IX treated LAW collection vessels includes the following:

- six PJMs for each tank (CXP-PJM-00002 through 00007; CXP-PJM-00008 through 00013; CXP-PJM-00014 through 00019)
- six jet pump pairs for each tank (CXP-EJCTR-00049 through 00054; CXP-EJCTR-00055 through 00060; CXP-EJCTR-00061 through 00066)
- two feed pumps (CXP-PMP-00002A/B)

The PJMs are used for mixing to maintain a uniform concentration for waste feed for sampling. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The cesium IX treated LAW feed pumps (CXP-PMP-00002A/B), located external to the tanks, are used to empty the tanks and to facilitate waste transfers.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.5.4.1 Design Standards

The cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The cesium IX treated LAW collection vessels have ASME 2:1 semielliptical heads (top and bottom) with an approximate 15-ft inside diameter and a 26-ft, 6-inch tangent to tangent length. The tank thicknesses are

0.75-inch (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for each tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX treated LAW collection vessels include the following tank internals, which are of a standard design with no moving parts:

- vessel spray nozzles
- level, density, and temperature instrumentation
- PJMs

4.5.4.2 Characteristics of the Waste

The contents of the cesium IX treated LAW collection vessels are cesium depleted filtered LAW from the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004).

The cesium depleted filtered LAW is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CXP-P0003).

The materials of construction for the cesium IX treated LAW collection vessels are compatible with the waste managed in the CXP. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX treated LAW collection vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.5.5 Cesium Ion Exchange Caustic Rinse Collection Vessel (CXP-VSL-00004)

The cesium IX caustic rinse collection vessel (CXP-VSL-00004) associated with this system is located in the cesium IX black cell (P-0111), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium IX caustic rinse collection vessel receives spent caustic regeneration solution that has been discharged from the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) during the regeneration sequence. The maximum capacity of the tank is 11,085 gallons.

CXP ancillary equipment associated with the cesium IX caustic rinse collection vessel includes the following:

- one PJM (CXP-PJM-00001)

- one jet pump pair (CXP-EJCTR-00009)
- four charge vessels (CXP-VSL-00006 through 00009)
- four RFDs (CXP-RFD-00004A/B and CXP-RFD-00005 through 00006)
- four RFD ejectors (CXP-EJCTR-00007 through 00008 and CXP-EJCTR-00011 through 00012)

The PJM is used for mixing added reagents. The PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer nominal 0.1 molar sodium hydroxide solution out of the tank to the cesium IX reagent vessel (CXP-VSL-00005) or to remove excess solution to the acidic/alkaline effluent vessels (PWD-VSL-00015 or PWD-VSL-00016). Each RFD is connected to an ejector located outside the tank.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life.

4.5.5.1 Design Standards

The cesium IX caustic rinse collection vessel (CXP-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The caustic rinse collection vessel has ASME flanged and dished heads with an approximate 10-ft, 5-inch inside diameter and a 14-ft, 3-inch tangent to tangent length. The tank thicknesses are 0.375-inch (shell) and 0.250-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium IX caustic rinse collection vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

4.5.5.2 Characteristics of the Waste

The contents of the cesium IX caustic rinse collection vessel are primarily demineralized water and spent reagents. Tank contents are 98 wt% water and less than 2 wt% solids. Contents have a pH of 13.0 (24590-PTF-N1D-CXP-P0008).

The materials of construction for this tank are compatible with the waste managed in the CXP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium IX caustic rinse collection vessel is considered to have a lower potential for corrosion and

erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.5.6 CXP Bulge (CXP-BULGE-00004) and CRP Bulge (CRP-BULGE-00001)

The valve bulge associated with the CXP (CXP-BULGE-00004) is located on the 56-ft elevation level, above the black cells, in room P-0317. The bulge (CRP-BULGE-00001) for the cesium resin addition process system (CRP), which has no DWP-regulated tanks and miscellaneous units, is also located in Room P-0317. The valve bulge for the CXP and the CRP bulge provide secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Room P-0317 has a radiological area classification of R3/C3 (Table 6).

The bulge and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the spent IX resin and resin transport liquid for a 40-year life.

4.5.6.1 Design Standards

The CXP and CRP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. CXP bulge confinement is designed to meet the requirements of AISC M016-89, Manual of Steel Construction. CRP bulge confinement is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities. The associated CXP process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.5.6.2 Characteristics of the Waste

The CXP bulge (CXP-BULGE-00004) transfers spent resin and resin transport liquid between the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) and the spent resin slurry vessels (RDP-VSL-00002A/B/C). These materials have a pH of 1 (24590-PTF-N1D-RDP-P0001). The CRP bulge (CRP-BULGE-00001) transfers fresh or spent resin and resin transport liquid to the IX columns.

The materials of construction for the bulges are compatible with the waste managed in the CXP/RDP/CRP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the CXP and the CRP bulges are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges.

4.6 Cesium Nitric Acid Recovery Process System

The CNP supports the CXP. The CNP provides eluant to the CXP and also receives eluate from the CXP. The CNP is housed primarily on the 0-ft elevation level in black cells P-0111 and P-0112 adjacent to the northern margin of the central hot cell area, and in the central hot cell (room P-0123) in the PTF building. Associated miscellaneous units are also housed on the 56-ft elevation level in room P-0320 and the 77-ft elevation level in room P-0430. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

4.6.1 Cesium Evaporator Eluant Lute Pot (CNP-VSL-00001) and Breakpot (CNP-BRKPT-00002)

The cesium evaporator eluant lute pot (CNP-VSL-00001) associated with this system is located in the resin disposal/CNP evaporator process black cell (P-0112), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium evaporator eluant lute pot provides a vacuum seal between the cesium evaporator breakpot (CNP-BRKPT-00002) and the cesium evaporator separator (CNP-EVAP-00001). The eluant from the cesium IX columns (CXP-IXC-00001 through CXP-IXC-00004) enters the lute pot by gravity drain from the breakpot and flows under vacuum to the cesium evaporator separator (CNP-EVAP-00001). The maximum capacity of the lute pot is 109 gallons.

CNP ancillary equipment associated with the cesium evaporator eluant lute pot includes the following:

- one breakpot (CNP-BRKPT-00002), with a total volume of 175 gallons
- one vessel-emptying ejector (CNP-EJCTR-00001)

The vessel-emptying ejector operates with an internal swirl wash nozzle to fluidize and remove solids, if any, that may collect in the lute pot over time.

The tank, breakpot, and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the eluant for a 40-year life.

4.6.1.1 Design Standards

The cesium evaporator eluant lute pot (CNP-VSL-00001) and the ancillary breakpot (CNP-BRKPT-00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The lute pot has ASME code flanged and dished heads with a 1.5-inch straight flange (top and bottom). The lute pot has an approximate 4-ft inside diameter and a 3-ft tangent to tangent length. The tank thicknesses are 0.25-inch minimum (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% greater than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium evaporator eluant lute pot includes vessel spray nozzles, which are of a standard design with no moving parts.

4.6.1.2 Characteristics of the Waste

The contents of the cesium evaporator eluant lute pot are primarily demineralized water from the post-elution rinse of the cesium IX columns. Tank contents are 98.2 wt% water and less than 2 wt% dissolved

solids. Contents have a pH of 0.5 under routine operating conditions (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0011).

The materials of construction for this tank are compatible with the waste managed in the CNP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator eluant lute pot is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.6.2 Cesium Evaporator Separator Vessel (CNP-EVAP-00001)

The cesium evaporator separator vessel (CNP-EVAP-00001) associated with this system is a miscellaneous unit located in the resin disposal/CNP evaporator process black cell (P-0112), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The cesium evaporator separator, which is initially charged with nitric acid for recovery of vapor product at the desired molarity, receives the cesium eluate from the cesium IX columns via the cesium evaporator eluate lute pot (CNP-VSL-00001). The separator operates under vacuum. The salts in the eluate are accumulated as a nitric acid/cesium liquor in the bottom of the separator and are transferred to the HLP (HLP-VSL-00027B or HLP-VSL-00028). Acid and water vapor product passes through a demister near the top of the separator, and then passes to the refluxed cesium evaporator nitric acid rectifier (CNP-DISTC-00001).

CNP ancillary equipment associated with the waste cesium evaporator separator includes the following:

- two vessel-emptying ejectors (CNP-EJCTR-00012and CNP-EJCTR-00013)
- one offgas ejector (CNP-EJCTR-00037)
- one transfer pump (CNP-PMP-00001)

The evaporator has all welded construction and is made of Alloy C-22 (UNS N06022) to ensure containment of the acid and eluate for a 40-year life.

4.6.2.1 Design Standards

The cesium evaporator separator vessel (CNP-EVAP-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium evaporator separator is vendor designed with nominal dimensions of 4-ft, 6-inch upper internal diameter, 6-ft, 5-inch lower internal diameter, and 22-ft, 11-inch overall height. The nominal 0.500-inch shell thickness

includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.6.2.2 Characteristics of the Waste

The contents of the cesium evaporator separator are primarily demineralized water from the post-elution rinse of the cesium IX columns plus a nitric acid charge. The cesium evaporator separator contents are 98.2 wt% water and less than 2 wt% dissolved solids. Contents have a pH of 0.5 under routine operating conditions (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0011).

The materials of construction for this unit are compatible with the waste managed in the CNP. Assessment for this unit that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator separator is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the separator.

4.6.3 Cesium Evaporator Concentrate Reboiler (CNP-HX-00001)

The cesium evaporator concentrate reboiler (CXP-HX-00001) associated with this system is a miscellaneous unit located in a hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The cesium evaporator concentrate reboiler is a heat exchanger that uses low pressure steam to heat the nitric acid charged cesium concentrate pumped from the cesium evaporator separator. Heated eluate is recirculated to the separator.

The tube-and-shell heat exchanger and process piping have all welded construction; the tube side of the unit is made of Alloy C-22 (UNS N06022) and the shell and piping are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

4.6.3.1 Design Standards

The cesium evaporator concentrate reboiler (CNP-HX-00001) is a tube-and-shell heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The evaporator concentrate reboiler is a vendor package with dimensions determined by the vendor. Thickness includes the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this unit. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.6.3.2 Characteristics of the Waste

The contents of the cesium evaporator concentrate reboiler are primarily demineralized water from the post-elution rinse of the cesium IX columns plus a nitric acid charge. Reboiler contents are 98.2 wt% water and less than 2 wt% dissolved solids, with a pH ranging from 0.3 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0004).

The materials of construction for the cesium evaporator concentrate reboiler are compatible with the waste managed in the CNP. Assessment for this miscellaneous unit located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator concentrate reboiler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the reboiler.

4.6.4 Cesium Evaporator Nitric Acid Rectifier (CNP-DISTC-00001)

The cesium evaporator nitric acid rectifier (CNP-DISTC-00001) associated with this system is a miscellaneous unit located in the CNP evaporator rectifier process area (P-0320), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The cesium evaporator nitric acid rectifier receives vapor leaving the cesium evaporator separator that contains water and nitric acid. The rectifier increases the concentration of the recovered acid. Recovered acid (0.5 molar nitric acid) flows from the bottom of the rectifier to the cesium evaporator recovered nitric acid vessel (CNP-VSL-00004). Water vapor enters the cesium evaporator condensers (CNP-HX-00002 through CNP-HX-00004).

The cesium evaporator nitric acid rectifier has all welded construction and is made of 6% molybdenum alloy (N08367/N08926) to ensure containment of the contents for a 40-year life.

4.6.4.1 Design Standards

The cesium evaporator nitric acid rectifier (CNP-DISTC-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The cesium evaporator nitric acid rectifier is vendor designed with nominal dimensions comprising a 3-ft inside diameter and a 12-ft tangent to tangent length. Shell thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.6.4.2 Characteristics of the Waste

The cesium evaporator nitric acid rectifier receives water vapor and gases (24590-PTF-3YD-CNP-00001). The materials of construction for this unit are compatible with the waste managed. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, this unit is considered to have a lower potential for corrosion and erosion on the

basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the unit.

4.6.5 Cesium Evaporator Primary Condenser (CNP-HX-00002), Intercondenser (CNP-HX-00003), and Aftercondenser (CNP-HX-00004)

The cesium evaporator primary condenser (CNP-HX-00002), intercondenser (CNP-HX-00003), and aftercondenser (CNP-HX-00004) associated with this system are miscellaneous units located in the CNP evaporator condenser room (P-0430), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 77-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

CNP ancillary equipment associated with the cesium evaporator condensers includes the following:

- two vacuum steam ejectors (CNP-EJCTR-00010A/B)
- one transfer/recirculation pump (CNP-PMP-00002)

The cesium evaporator condensers are part of an evaporator train that removes excess water from the pre-elution and post-elution rinses sent to the cesium evaporator separator vessel from the cesium IX columns. De-entrained water vapor and nitric acid enter the cesium evaporator primary condenser (CNP-HX-00002), where condensable vapors are removed by condensation. Two ejectors generate the vacuum requirements that enable boiling. The first ejector (CNP-EJCTR-00010A) discharges steam and noncondensable gases to the cesium evaporator intercondenser (CNP-HX-00003) to condense steam from the ejector. The second ejector (CNP-EJCTR-00010B) draws noncondensable gases from the intercondenser and discharges steam and noncondensable gases to the aftercondenser (CNP-HX-00004) to condense the ejector steam. The condensate from each of the condensers is discharged to the acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016).

The condensers and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

4.6.5.1 Design Standards

The cesium evaporator primary condenser (CNP-HX-00002), intercondenser (CNP-HX-00003), and aftercondenser (CNP-HX-00004) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The cesium evaporator condensers are vendor designed with nominal dimensions comprising a 3-ft inside diameter and a 12-ft tangent to tangent length. Shell thickness includes the minimum 0.040-inch standard corrosion allowance, which is approximately 40% greater than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these units. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.6.5.2 Characteristics of the Waste

The cesium evaporator condensers receive water vapor and gases (24590-PTF-3YD-CNP-00001). The materials of construction for these units are compatible with the waste managed. The schedule for conducting periodic assessments of these units is provided in Table 7. For the purpose of scheduling periodic assessments, these units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the units.

4.6.6 Eluate Contingency Storage Vessel (CNP-VSL-00003) and Breakpots (CNP-BRKPT-00001 and CNP-BRKPT-00002)

The eluate contingency storage vessel (CNP-VSL-00003) associated with this system is located in the cesium IX black cell (P-0111), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The eluate contingency storage vessel receives acid that needs reprocessing from the cesium evaporator recovered nitric acid vessel (CNP-VSL-00004), cesium concentrate from the cesium evaporator separator (CNP-EVAP-00001), or cesium eluate from the cesium IX columns for temporary storage. Acid, cesium eluate, and cesium concentrate enter the eluate contingency storage vessel by gravity drain from the cesium concentrate breakpot (CNP-BRKPT-00001). The maximum capacity of the tank is 21,570 gallons.

CNP ancillary equipment associated with the eluate contingency storage vessel includes the following:

- two breakpots (CNP-BRKPT-00001 and CNP-BRKPT-00002), each with a total volume of 175 gallons
- four PJMs (CNP-PJM-00013 through 00016)
- four jet pump pairs (CNP-EJCTR-00015 through 00018)
- one charge vessel (CNP-VSL-00166)
- one RFD (CNP-RFD-00003)
- one RFD ejector (CNP-EJCTR-00023)
- three vessel-emptying ejectors (CNP-EJCTR-00034 through 000036)

The PJMs are used for mixing tank contents. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The charge vessel located within the parent tank is used in conjunction with the RFD. The RFD, located within the tank, is used to transfer temporarily stored cesium eluate to the cesium evaporator separator (CNP-EVAP-00001) via the cesium evaporator breakpot (CNP-BRKPT-00002). The RFD is connected to an RFD ejector located outside the tank. Vessel-emptying ejectors are used to remove cesium concentrate to the HLP (HLP-VSL-00027B or HLP-VSL-00028).

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the tank contents for a 40-year life. The tank cooling jacket, which removes heat generated in CNP-VSL-00003 caused by radioactive decay and/or neutralization, is made of stainless steel 304L (UNS 30403).

4.6.6.1 Design Standards

The eluate contingency storage vessel (CNP-VSL-00003) and the ancillary breakpots (CNP-BRKPT-00001 and 00002) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The contingency storage vessel has ASME code flanged and dished heads with 2-inch straight flange (top and bottom). The tank has an approximate inside 14-ft diameter and a 16-ft tangent to tangent length. The tank thicknesses are 0.75-inch minimum (shell and top head) and 1.125-inch (bottom head). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.016-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The eluate contingency storage vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessel
- RFD
- vessel spray nozzles
- level, density, and temperature instrumentation

4.6.6.2 Characteristics of the Waste

The contents of the eluate contingency storage vessel are primarily cesium concentrate from the cesium evaporator separator, demineralized water from the post-elution rinse of the cesium IX columns, or nitric acid from the recovered nitric acid vessel. Tank contents are 98.2 wt% water and less than 2 wt% dissolved solids (eluant), recovered nitric acid, or 47.6 wt% water and 57.4 wt% dissolved solids (cesium concentrate). Contents have a pH of 0.3 (eluant and recovered nitric acid) or a pH of 14 (cesium concentrate) (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-CNP-P0009).

The materials of construction for this tank are compatible with the waste managed in the CNP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the eluate contingency storage vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.6.7 Cesium Evaporator Recovered Nitric Acid Vessel (CNP-VSL-00004)

The cesium evaporator recovered nitric acid vessel (CNP-VSL-00004) associated with this system is located in the resin disposal/CNP evaporator process black cell (P-0112), which is equipped with a

stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

Recovered acid flows by gravity from the bottom of the cesium evaporator nitric acid rectifier (CNP-DISTC-00001) to the cesium evaporator recovered nitric acid vessel (CNP-VSL-00004). Recovered nitric acid is transferred directly into the eluant stream feeding the IX columns (CXP-IXC-00001 through 00004) via pumps (CXP-PMP-00001A/B). The cesium evaporator recovered nitric acid vessel is equipped with remote sampling capability. The maximum capacity of the tank is 11,115 gallons.

CNP ancillary equipment associated with the cesium evaporator recovered nitric acid vessel includes the following:

- four PJMs (CNP-PJM-00019 through 00022)
- four jet pump pairs (CNP-EJCTR-00024 through 00027)
- one charge vessel (CNP-VSL-00162)
- one RFD (CNP-RFD-00005)
- one RFD ejector (CNP-EJCTR-00028)
- one vessel-emptying ejector (CNP-EJCTR-00014)

The PJMs are used for mixing tank contents. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The charge vessel located within the parent tank is used in conjunction with the RFD. The RFD, located within the tank, is used to transfer recovered acid requiring reprocessing to the eluate contingency storage vessel (CNP-VSL-00003) via the cesium concentrate breakpot (CNP-BRKPT-00001). The RFD is connected to an RFD ejector located outside the tank. The vessel-emptying ejector is used for vessel decontamination.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the tank contents for a 40-year life.

4.6.7.1 Design Standards

The cesium evaporator recovered nitric acid vessel (CNP-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME code flanged and dished heads (top and bottom). The tank has an approximate 9-ft, 6-inch inside diameter and a 19-ft tangent to tangent length. The tank thicknesses are 0.625-inch minimum (shell) and 0.500-inch (top and bottom head). Thicknesses include the minimum0.040-inch standard corrosion allowance, which is adequate for the required 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The cesium evaporator recovered nitric acid vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessel
- RFD
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor halide, cesium and nitric acid concentrations, tank contents are routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

4.6.7.2 Characteristics of the Waste

The contents of the cesium evaporator recovered nitric acid vessel are nitric acid. Contents have a pH of 0.5 (24590-PTF-3YD-CNP-00001).

The materials of construction for this tank are compatible with the waste managed in the CNP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the cesium evaporator recovered nitric acid vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.7 Treated LAW Evaporation Process System

The TLP increases the concentration of the treated LAW prior to transfer to the LAW vitrification facility for glassification. The TLP also provides lag storage capacity and reduction/concentration for LAW submerged bed scrubber (SBS) condensate recycled from the LAW vitrification facility. The TLP is housed primarily on the 0-ft elevation level primarily in black cells P-0117 and P-0117A adjacent to the northeastern margin of the hot cell area, in the hot cell (room P-0123), and in room P-0118 in the eastern portion of the PTF building. Some miscellaneous units are located on the 56-ft elevation level in room P-0325. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access or in accessible areas.

4.7.1 LAW SBS Condensate Receipt Vessels (TLP-VSL-00009A/B)

The LAW SBS condensate receipt vessels (TLP-VSL-00009A/B) associated with this system are located in the treated LAW evaporator and concentrate storage black cells (P-0117 and P-0117A), which are each equipped with a stainless steel liner, a sump, and a sump ejector. Each stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. These rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The LAW SBS condensate receipt vessels receive and neutralize SBS condensate liquor from the LAW vitrification facility for feed to the treated LAW evaporator separator (TLP-SEP-00001). Under infrequent conditions, these tanks also receive LAW concentrate recycle from the treated LAW concentrate storage vessel (TCP-VSL-00001) and pretreatment off-specification effluents. Each LAW SBS concentrate receipt vessel is equipped with remote sampling capability. The maximum capacity of each tank is 130,010 gallons.

TLP ancillary equipment associated with the LAW SBS condensate receipt vessels includes the following:

- eight PJMs for each tank (TLP-PJM-00001 through 00008; TLP-PJM-00009 through 00016)
- four jet pump pairs (TLP-EJCTR-00009 through 00016; TLP-EJCTR-00018 through 00025)
- two transfer pumps (TLP-PMP-00005A/B)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The two SBS condensate feed pumps (TLP-PMP-00005A/B), located in the adjacent accessible room P-0110D, are used to transfer waste feed to the treated LAW evaporator separator (TLP-SEP-00001).

The tanks and process piping have all welded construction and are made of 6% molybdenum alloy (UNS N08367/N08926) to ensure containment of the tank contents for a 40-year life.

4.7.1.1 Design Standards

The LAW SBS concentrate receipt vessels (TLP-VSL-00009A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The LAW SBS concentrate receipt vessels have ASME flanged and dished heads with an approximate 26-ft inside diameter and a 27-ft, 4-inch tangent to tangent length. The tank thicknesses are 1.000-inch (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.056-inch localized protection required for bottom head to accommodate PJM discharge velocities required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The LAW SBS concentrate receipt vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00005A/B and routed to a glovebox. The sampling device is located outside the cell in a shielded but accessible location.

Piping in the transfer line that conveys dangerous waste from the LAW vitrification facility to the TLP tanks is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer

line is encased with an outer carbon steel pipe that drains to an LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00014).

4.7.1.2 Characteristics of the Waste

The LAW SBS concentrate receipt vessels receive SBS condensate from the LAW vitrification facility. SBS condensate has a pH of 6.8 to 9.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TLP-P0001).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the TLP. Assessment for these tanks located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the LAW SBS concentrate receipt vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.7.2 Treated LAW Evaporator Separator Vessel (TLP-SEP-00001)

The treated LAW evaporator separator vessel (TLP-SEP-00001) associated with this system is a miscellaneous unit located in the treated LAW evaporator black cell (P-0117), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

TLP ancillary equipment associated with the treated LAW evaporator separator includes two pumps (TLP-PMP-00011A/B). The treated LAW evaporator separator receives the cesium-depleted treated LAW from the cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) and SBS condensate from the LAW SBS condensate receipt vessels (TLP-VSL-00009A/B). The separator operates under vacuum. The concentrated LAW accumulated in the bottom of the separator is transferred to the treated LAW concentrate storage vessel (TCP-VSL-00001) using the treated LAW evaporator concentrate pumps (TLP-PMP-00011A/B). Water vapor and gases pass through demister pads near the top of the separator, and de-entrained vapor and non-condensable gases then pass to the treated LAW evaporator separator condensers (TLP-COND-00001 through TLP-COND-00003).

The evaporator separator has all welded construction and is made of stainless steel 304L (UNS S30403)) to ensure containment of the waste for a 40-year life.

4.7.2.1 Design Standards

The treated LAW evaporator separator vessel (TLP-SEP-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The treated LAW evaporator separator is vendor designed with nominal dimensions of 7-ft, 6-inch upper internal diameter, 11-ft, 5-inch lower internal diameter, and 9-ft overall height. A nominal 0.500-inch shell thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.7.2.2 Characteristics of the Waste

The treated LAW evaporator separator condenses cesium depleted filtered LAW from the cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C) and SBS condensate from the LAW SBS concentrate receipt vessels (TLP-VSL-00009A/B) to produce the concentrated treated LAW that is transferred to the LAW vitrification facility.

The concentrated treated LAW is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TLP-P0005).

The materials of construction for the treated LAW evaporator separator are compatible with the wastes managed in the TLP. Assessment for this miscellaneous unit located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the treated LAW evaporator separator is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the separator.

4.7.3 Treated LAW Evaporator Reboiler (TLP-RBLR-00001)

The treated LAW evaporator reboiler (TLP-RBLR-00001) associated with this system is a miscellaneous unit located in the hot cell area (P-0123), which is equipped with a stainless steel liner and three sumps with sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The treated LAW evaporator reboiler is part of an evaporator train that concentrates waste to provide optimum conditions for waste processing prior to the transfer to the treated LAW concentrate receipt vessel (TCP-VSL-00001) and subsequent delivery to the LAW vitrification facility. The treated LAW evaporator reboiler is equipped with an external recirculation pump (TLP-PMP-00001).

The tube-and-shell reboiler and process piping have all welded construction; the tube side of the unit is made of Hastelloy G-30 Alloy (N06030) or equivalent and the shell side is made of stainless steel 304L (UNS S30403) to ensure containment of the contents for a 40-year life.

4.7.3.1 Design Standards

The treated LAW evaporator reboiler (TLP-RBLR-00001) is a tube-and-shell heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The evaporator reboiler is a vendor package with dimensions determined by the vendor. Thickness includes the minimum 0.040-inch standard corrosion allowance, which is adequate for the

0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this unit. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.7.3.2 Characteristics of the Waste

The contents of the treated LAW evaporator reboiler are treated LAW concentrate from the LAW pretreatment process. The reboiler receives cesium depleted filtered LAW from the cesium IX treated LAW collection vessels (CXP-VSL-00026A/B/C), SBS condensate from the LAW SBS concentrate receipt vessels (TLP-VSL-00009A/B), and increasingly concentrated treated LAW that is recirculated from the treated LAW evaporator separator (TLP-SEP-00001).

The cesium depleted filtered LAW is approximately 73.4 wt% water, 26.6 wt% dissolved solids, and 0 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010). SBS condensate has a pH of 14.4. The concentrated treated LAW to be transferred to the LAW vitrification facility's LAW concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of 14.0 (24590-WTP-M4C-V11T-00010).

The materials of construction for the treated LAW evaporator reboiler are compatible with the wastes managed in the TLP. Assessment for this miscellaneous unit located in the central hot cell is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the treated LAW evaporator reboiler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the reboiler.

4.7.4 Treated LAW Evaporator Primary Condenser (TLP-COND-00001), Intercondenser (TLP-COND-00002), and Aftercondenser (TLP-COND-00003)

The treated LAW evaporator primary condenser (TLP-COND-00001), intercondenser (TLP-COND-00002), and aftercondenser (TLP-COND-00003) associated with this system are miscellaneous units located at 56-ft elevation level in the treated LAW condenser area (P-0325), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

TLP ancillary equipment associated with the treated LAW evaporator condensers includes two ejectors (TLP-EJCTR-00064 and TLP-EJCTR-00067).

The treated LAW evaporator condensers are part of an evaporator train that removes excess water from the cesium-depleted treated LAW sent to the treated LAW evaporator separator vessel from the cesium IX columns. De-entrained water vapor and gases enter the treated LAW evaporator primary condenser (TLP-COND-00001), where condensable vapors are removed by condensation. Two ejectors generate the vacuum requirements that enable boiling. The first ejector (TLP-EJCTR-00064) discharges steam and noncondensable gases to the treated LAW evaporator intercondenser (TLP-COND-00002) to condense steam from the ejector. The second ejector (TLP-EJCTR-00067) draws noncondensable gases from the intercondenser and discharges steam and noncondensable gases to the aftercondenser (TLP-COND-

00003) to condense the ejector steam. The condensate from each of the condensers is discharged to the treated LAW evaporator condensate vessel (TLP-VSL-00002).

The condensers and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

4.7.4.1 Design Standards

The treated LAW evaporator primary condenser (TLP-COND-00001), intercondenser (TLP-COND-00002), and aftercondenser (TLP-COND-00003) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The treated LAW evaporator condensers are vendor designed with nominal dimensions for the primary condenser comprising a 4-ft, 2-inch inside diameter and a 23-ft length. Shell thickness includes the minimum 0.040-inch standard corrosion allowance, which is approximately 40% greater than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these units. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.7.4.2 Characteristics of the Waste

The treated LAW evaporator condensers receive water vapor and gases (24590-PTF-3YD-TLP-00001). The materials of construction for these units are compatible with the waste managed. The schedule for conducting periodic assessments of these units is provided in Table 7. For the purpose of scheduling periodic assessments, these units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the units.

4.7.5 Treated LAW Evaporator Condensate Vessel (TLP-VSL-00002)

The treated LAW evaporator condensate vessel (TLP-VSL-00002) associated with this system is located in the alkaline effluent collection area (P-0118), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the volume of the largest tank in the room plus 20 minutes of fire water sprinkler discharge Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

TLP ancillary equipment associated with the treated LAW evaporator condensate vessel includes two pumps (TLP-PMP-00002A/B). The treated LAW evaporator condensate vessel receives condensate from the treated LAW evaporator condensers and treated LAW evaporator separator demister by gravity drain, which is then transferred to the process condensate tanks (RLD-TK-00006A/B) using the treated LAW evaporator condensate pumps (TLP-PMP-00002A/B). A remote sampling point for this tank is located on the discharge side of the condensate pumps. The maximum capacity of the tank is 2,300 gallons.

The tank and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the contents for a 40-year life.

4.7.5.1 Design Standards

The treated LAW evaporator condensate vessel (TLP-VSL-00002) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The treated LAW evaporator condensate vessel has ASME flanged and dished heads with a 6-ft approximate inside diameter and a 11-ft tangent to tangent length. The tank thicknesses are 0.250 in (shell and heads). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00002A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location.

4.7.5.2 Characteristics of the Waste

The treated LAW evaporator condensate vessel receives condensed water vapor (24590-PTF-3YD-TLP-00001). The materials of construction for this tank are compatible with the waste managed. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.8 Treated LAW Concentrate Storage Process System

The TCP is designed to provide storage capacity for treated LAW concentrate, and then transfer treated LAW concentrate from the PTF to the LAW vitrification facility. The TCP is housed on the 0-ft elevation level primarily in black cell P-0117A in the eastern portion of the PTF building. Valves and transfer and return pumps are located in an adjacent accessible area.

4.8.1 Treated LAW Concentrate Storage Vessel (TCP-VSL-00001)

The treated LAW concentrate storage vessel (TCP-VSL-00001) associated with this system is located in the treated LAW concentrate storage black cell (P-0117A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The treated LAW concentrate storage vessel receives up to 7 days of lag storage for treated LAW concentrate from the TLP evaporator (TLP-SEP-00001). The treated LAW concentrate storage vessel is equipped with remote sampling capability. The maximum capacity of the tank is 146,740 gallons.

TCP ancillary equipment associated with the treated LAW concentrate storage vessel includes the following:

- eight PJMs (TCP-PJM-00001 through TCP-PJM-00008)
- eight jet pump pairs (TCP-EJCTR-00002 through TCP-EJCTR-00009)
- two transfer pumps (TCP-PMP-00001A/B)

The PJMs are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The two transfer pumps are located in an adjacent C3 room (room P-0116) and are used to transfer treated LAW to the LAW vitrification facility.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the treated LAW for a 40-year life.

4.8.1.1 Design Standards

The treated LAW concentrate storage vessel (TCP-VSL-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The treated LAW concentrate storage vessel has ASME flanged and dished heads with an approximate 26-ft, 6-inch inside diameter and a 30-ft, 2-inch tangent to tangent length. The tank thicknesses are 1-inch (shell), and 1-inch minimum ASME code flanged and dished head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for this tank), plus additional 0.164-inch localized protection required for bottom head to accommodate PJM discharge velocities. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The treated LAW concentrate storage vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using TCP-PMP-00001A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-ft elevation level.

Piping in the transfer lines that convey treated LAW from the storage vessel to the LAW vitrification facility is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to an LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00016 through PWD-LDB-00018).

4.8.1.2 Characteristics of the Waste

The contents of the treated LAW concentrate storage vessel are treated LAW concentrate from the LAW pretreatment process. The concentrated treated LAW to be transferred to the LAW vitrification facility LAW concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) is approximately 57.9 wt%

water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of approximately 12.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TCP-P0001).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the TCP. Assessment for this tank that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the treated LAW concentrate storage vessel is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.8.2 TCP Bulge (TCP-BULGE-00004)

The valve bulge associated with the TCP (TCP-BULGE-00004) is located on the 0-ft elevation level, adjacent to the treated LAW concentrate storage black cell, in room P-0116. The valve bulge for the TCP provides secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Room P-0116 has a radiological area classification of R3/C3 (Table 6).

The bulge and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the treated LAW concentrate and treated solids for a 40-year life.

4.8.2.1 Design Standards

The TCP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge confinement is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities. The associated TCP process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.8.2.2 Characteristics of the Waste

The TCP bulge (TCP-BULGE-00004) transfers treated LAW, treated solids, waste feed, and process condensate. The treated LAW concentrate is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of 14.0; treated solids are approximately 20.0 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for the bulge are compatible with the waste managed in the TCP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the TCP bulge is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulge.

4.9 Spent Resin Collection and Dewatering Process System

The RDP supports the CXP by removing spent IX resin from the IX columns. The RDP is the point of verification that spent IX resin meets waste acceptance criteria and can be transferred out of the PTF for disposal as solid radioactive waste. The RDP also includes the process for dewatering the resin. The

RDP is housed on the 0-ft elevation level primarily in black cell P-0112 in the western portion of the PTF building and accessible cell P-0119 in the eastern portion of the PTF building. Valves and transfer and return pumps are located in the central hot cell for remote maintenance access.

4.9.1 Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C)

The spent resin slurry vessels (RDP-VSL-00002A/B/C) associated with this system are located in the resin disposal/CNP evaporator black cell (P-0112), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The spent resin slurry vessels serve as both the source of transport liquid and the receipt vessels for spent resin slurry and are used to collect and transfer a batch of spent resin every week. The spent resin slurry vessels are equipped with remote sampling capability. The maximum capacity of each tank is 15,230 gallons.

RDP ancillary equipment associated with the spent resin slurry vessels includes the following:

- four PJMs for each tank (RDP-PJM-00001 through RDP-PJM-00004; RDP-PJM-00005 through RDP-PJM-00008; RDP-PJM-00009 through RDP-PJM-00012)
- four jet pump pairs for each tank (RDP-EJCTR-00001 through RPD-EJCTR-00004; RDP-EJCTR-00005 through RDP-EJCTR-00008; RDP-EJCTR-00009 through RDP-EJCTR-00012)
- two transfer pumps (RDP-PMP-00008A/B)

The PJMs are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. The two spent resin slurry pumps are located in the adjacent hot cell area (room P-0123) and are used to transfer liquid and slurry to and from the spent resin slurry vessels.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.9.1.1 Design Standards

The spent resin slurry vessels (RDP-VSL-00002A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. Each spent resin slurry vessel has ASME 2:1 elliptical heads with an approximate 12-ft inside diameter and a 14-ft tangent to tangent length. The tank thicknesses are 0.750-inch (shell) and 0.625-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for this tank), plus additional 0.060-inch localized protection required for bottom head to accommodate PJM discharge velocities. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The spent resin slurry vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tank using RDP-PMP-00008A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location.

4.9.1.2 Characteristics of the Waste

Contents of the spent resin slurry vessels consist of spent resin from the cesium IX columns plus transport fluid, and have a pH of 1 (24590-PTF-N1D-RDP-P0001). During normal operations, the tanks contain approximately 8% volume/volume solids. The solids content is greater during the first few minutes of displacement when the incoming slurry line is over 50% volume/volume solids.

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the RDP. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the spent resin slurry vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.9.2 Spent Resin Dewatering Moisture Separation Vessel (RDP-VSL-00004)

The spent resin dewatering moisture separation vessel (RDP-VSL-00004) associated with this system is located in the spent resin dewatering equipment room (P-0119), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to a height to contain the volume of the tank plus 20 minutes of fire water sprinkler discharge, and forms part of the secondary containment for the tank. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5/R3/C3 and is accessible during the 40-year life of the facility (Table 6). Room P-0119 is normally maintained as an R3/C3 area except when dewatering operations are being performed, at which time the room is designated as R5/C5.

The spent resin dewatering moisture separation vessel is part of a vendor dewatering package provided to reduce the water content of the spent resin to below transportation and disposal limits within the specified processing time. This tank and ancillary equipment are mounted on the spent resin dewatering skid (RDP-SKID-00001). The maximum capacity of the tank is 101 gallons.

RDP ancillary equipment associated with the spent resin dewatering moisture separation vessel includes the following:

- spent resin dewatering container pump (RDP-PMP-00011)
- spent resin dewatering blower (RDP-BLWR-00001)

- spent resin dewatering prefilters (RDP-FILT-00001A/B)
- spent resin dewatering coalescing filters (RDP-FILT-00002A/B)
- spent resin dewatering fill head (RDP-SP-00001)
- spent resin dewatering sample cylinder (RDP-SMPLR-00001)

The tank and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.9.2.1 Design Standards

The spent resin dewatering moisture separation vessel (RDP-VSL-00004) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The spent resin dewatering moisture separation vessel is vendor designed with an approximate2-ft inside diameter and 5-ft total length. The tank thickness are 0.250-inch minimum (shell), 0.500-inch minimum (top head), and 0.625-inch minimum (bottom head). Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.9.2.2 Characteristics of the Waste

Contents of the spent resin dewatering moisture separation vessel consist of spent resin from the cesium IX columns plus transport fluid, and have a pH of 1 (24590-PTF-N1D-RDP-P0002) . During normal operations, the tank contains approximately 8% volume/volume solids.

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the RDP. The schedule for conducting periodic assessments of this tank is provided in Table 7. This tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank. However, for purposes of integrity assessment, this tank is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility. Therefore, the frequency of the integrity assessment of this tank is accelerated to be consistent with the frequency for tanks with higher potential for corrosion and erosion.

4.10 Pretreatment Vessel Vent Process System and Process Vessel Vent System

The PVP consists of the forced and passive purge air supply to the pretreatment process tanks, vent exhaust collection header, and the process treatment for removal of soluble nitrogen oxide compounds (NOx) and acid gases, solid particulates, liquid droplets, and mists from the vent gases. The PVP controls the hydrogen concentration below the lower flammability limit, and also provides oxidation and removal of volatile organic compounds (VOCs) present in the exhaust gases. The vessel vent exhaust fans in the PVV control and maintain the suction pressure inside the various process tanks in the pretreatment area. The PVP and PVV are primarily housed on the 56-ft elevation level in the filter cave (P-0335) or in accessible areas on the 56-ft and 77-ft elevation levels. Some equipment is located on the 0-ft elevation level in black cells (P-0102A and P-0104).

The PVV provides the containment and confinement of sources of contamination inside the process tanks. The system consists of heating, ventilation and air conditioning (HVAC) equipment, controls,

instrumentation, piping and accessories to support the removal of vent exhausts from various process tanks by the PVP.

4.10.1 Caustic Scrubber (PVP-SCB-00002)

The caustic scrubber (PVP-SCB-00002) associated with this system is a miscellaneous unit located in the ultrafiltration black cell (P-0104), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The caustic scrubber (PVP-SCB-00002) receives offgas from the vessel vent header and provides confinement of the exhaust gases, absorbs soluble NOx and acid gases, and removes large solid particulates from the exhaust gases. The scrubber includes a demister that provides for condensation of excess water vapor from the vent exhaust gases. The vessel vent scrubber recirculation pumps (PVP-PMP-00001A/B) supply the scrubbing liquid solution to the top of the packed bed section of the scrubber (routed through the vessel vent scrubbing liquid cooler PVP-HX-00002) and supply part of the solution directly to the bottom of the tank to provide adequate mixing.

The caustic scrubber is fabricated from stainless steel 316L (UNS S31603) with the column packing and demister packing made from 6% molybdenum alloy (UNS N08367).

4.10.1.1 Design Standards

The caustic scrubber (PVP-SCB-00002) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The caustic scrubber housing has the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and a 0.004-inch erosion allowance required for the caustic scrubber housing. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.1.2 Characteristics of the Waste

The inlet offgas is approximately 0.1 wt% water, 99.9 wt% gases (primarily air with small amounts of NOx and acid gases), and less than 1 wt% solids (24590-WTP-M4C-V11T-00010, 24590-PTF-3YD-PVP-00001).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVP. Assessment for this miscellaneous unit that is located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the caustic scrubber is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the caustic scrubber.

4.10.2 Scrubbing Liquid Cooler (PVP-HX-00002)

The scrubbing liquid cooler (PVP-HX-00002) associated with this system is a miscellaneous unit located in a process (bulge) area (P-0302), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The scrubbing liquid cooler removes heat of reaction and condensation from the exhaust gases by chilled water circulation. The vessel vent scrubber recirculation pumps (PVP-PMP-00001A/B) circulate the scrubbing liquid from the scrubber through the cooler and returns the solution to the top of the packed bed section of the scrubber.

The scrubbing liquid cooler and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the contents for a 40-year life.

4.10.2.1 Design Standards

The scrubbing liquid cooler (PVP-HX-00002) is a plate and frame heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The scrubbing liquid cooler is a vendor package with dimensions determined by the vendor. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.2.2 Characteristics of the Waste

The scrubbing liquid cooler receives the caustic scrubbing liquid (5 molar sodium hydroxide) with entrained gases (primarily NOx and acid gases) and less than 1 wt% solids (24590-WTP-M4C-V11T-00010, 24590-PTF-3YD-PVP-00001).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVP. The schedule for conducting periodic assessments of this unit is provided in Table 7. For the purpose of scheduling periodic assessments, the scrubbing liquid cooler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in this miscellaneous unit.

4.10.3 HEME Filters (PVP-HEME-00001A/B/C)

The HEME filters (PVP-HEME-00001A/B/C) associated with this system are miscellaneous units located in the filter cave (P-0335). The filter cave has miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.). Each drain is equipped with leak detection instrumentation. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The HEME filters receive the combined vessel vent exhaust stream flow from the caustic scrubber (PVP-SCB-00002) and are used to remove fine aerosols and particulates. Remote change out capability for the filter cartridges from the HEMEs is provided.

The HEME housing and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste stream for a 40-year life.

4.10.3.1 Design Standards

The HEME filters (PVP-HEME-00001A/B/C) are housed in tanks fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and code-stamped. The HEME vessels have ASME flanged and dished heads with an approximate 5-ft, 6-inch inside diameter and a 12-ft, 6-inch tangent to tangent length. The housing vessel thicknesses are 0.625-inch (shell) and 0.500-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.3.2 Characteristics of the Waste

The HEME filters receive caustic scrubber offgas is approximately 0.2 wt% water, 99.9 wt% gases (primarily NOx and hydroxide ion) and less than 1 wt% solids (24590-WTP-M4C-V11T-00010, 24590-PTF-3YD-PVP-00001).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVP. Assessment for these miscellaneous units located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEME filters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

4.10.4 Vessel Ventilation HEME Drain Collection Vessel (PVP-VSL-00001)

The vessel ventilation HEME drain collection vessel (PVP-VSL-00001) associated with this system is located in the HLW receipt and blending black cell (P-0102A), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The vessel ventilation HEME drain collection vessel receives the effluent from the HEME filters. The HEME drain transfer pumps (PVP-PMP-00002A/B) are used for recirculation and for transfer of the HEME drain effluent to the plant wash vessel (PWD-VSL-00044). The maximum capacity of the tank is 1,969 gallons.

The vessel ventilation HEME drain collection vessel and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the effluent for a 40-year life.

4.10.4.1 Design Standards

The vessel ventilation HEME drain collection vessel (PVP-VSL-00001) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The HEME drain collection vessel has ASME 2:1 semi-elliptical heads with an approximate 6-ft inside diameter and a 7-ft, 4-inch tangent to tangent length. The tank thicknesses are 0.500-inch minimum shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.4.2 Characteristics of the Waste

The vessel ventilation HEME drain collection vessel receives demineralized water with entrained particulates washed from the HEME filters. Contents of the tank are approximately 100 wt% water with less than 1 wt% solids, and have a pH of 10 to 11 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-PVP-P0002).

The materials of construction for this tank are compatible with the waste managed in the PVP. Assessment for this tank located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the vessel ventilation HEME drain collection vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.10.5 Primary and Secondary HEPA Filters (PVV-HEPA-00001A/B and PVV-HEPA-00002A/B)

The PVV primary HEPA filters (PVV-HEPA-00001A/B) associated with this system are miscellaneous units located in the filter cave (P-0335). The HEPA filters, which are dry off-gas equipment and are not required to have secondary containment, sit on concrete. However, the filter cave has other miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.) Room P-0335 has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The PVV secondary HEPA filters (PVV-HEPA-00002A/B) associated with this system are miscellaneous units located in the HEPA filter room (P-0324) adjacent to the filter cave. This room is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. Room P-0324 has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The HEPA filters receive the vessel vent stream from the vessel vent caustic scrubber (PVP-SCB-00002) following removal of aerosols and particulates by the HEME filters (PVP-HEME-00001A/B/C). The gas passes through HEPA filter housings forming two trains: a main train (PVV-HEPA-00001A and PVV-HEPA-00002A) used in normal operations and an auxiliary train (PVV-HEPA-00001B and PVV-HEPA-00002B) used as an installed back-up. The HEPA filter housings in each train are arranged to form primary and secondary stages of filtration.

The HEPA filters housing and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste stream for a 40-year life.

4.10.5.1 Design Standards

The HEPA filters are a vendor package. The primary and secondary HEPA filters are radial flow-type and are installed in the vertical position in specially designed housings. The primary HEPA filter housings are designed for remote maintenance. The secondary HEPA filters are in manual safe-change housings. The housings are in designed accordance with ASME AG-1.

4.10.5.2 Characteristics of the Waste

The HEPA filters receive outlet vapors from the HEME filters that are approximately 22.8 wt% water, 77.2 wt% gases (primarily nitrogen [N_2], oxygen [O_2], and carbon dioxide [CO_2]), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVV/PVP. Assessment for the primary HEPA filters located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The secondary HEPA filters are accessible. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filter units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

4.10.6 VOC Oxidizer Unit (PVP-OXID-00001)

The VOC oxidizer unit (PVP-OXID-00001) associated with this system is a miscellaneous unit located in the PVP thermal oxidizer room (P-0326) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no DWP-regulated floor drains. Room P-0326 has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The VOC oxidizer unit is an electrically-heated, regenerative thermal oxidizer that is part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001).

The VOC oxidizer unit housing and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the vent gas for a 40-year life.

4.10.6.1 Design Standards

The VOC oxidizer unit (PVP-OXID-00001) is a custom-built vendor package. The housing for the VOC oxidizer unit has a minimum 0.375-inch thickness, which includes a 0.0625-inch corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.6.2 Characteristics of the Waste

The VOC oxidizer unit receives filtered vent gas from the HEPA filters that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily N_2, O_2, and CO_2), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the VOC oxidizer unit is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

4.10.7 After Cooler (PVP-CLR-00001)

The after cooler (PVP-CLR-00001) associated with this system is a miscellaneous unit located in the PVP thermal oxidizer room (P-0326) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no DWP-regulated floor drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The after cooler is a finned-tube heat exchanger that is part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001).

The tube-and-shell after cooler and process piping have all welded construction; the shell is made of stainless steel 304L (UNS S30403) to ensure containment of the vent gas for a 40-year life. The tubes are made of stainless steel 316L (UNS S31603).

4.10.7.1 Design Standards

The after cooler (PVP-CLR-00001) is a tube-and-shell heat exchanger. The unit is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The after cooler is a vendor package with dimensions determined by the vendor. Thickness includes the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.7.2 Characteristics of the Waste

The after cooler receives filtered vent gas from the oxidizer unit that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily N_2, O_2, and CO_2), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the after cooler is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

4.10.8 Carbon Bed Adsorbers (PVP-ADBR-00001A/B)

The carbon bed adsorbers (PVP-ADBR-00001A/B) associated with this system are miscellaneous units located in the carbon bed adsorber room (P-0328) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The carbon bed adsorbers are part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001). The carbon bed adsorbers operate as a polishing step for abatement of organic compounds downstream of the thermal oxidizer and after cooler.

The carbon bed adsorbers housing and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the vent gas for a 40-year life.

4.10.8.1 Design Standards

The carbon bed adsorbers (PVP-ADBR-00001A/B) are housed in tanks fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, but are not code-stamped. The carbon bed adsorber vessels have the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.8.2 Characteristics of the Waste

The carbon bed adsorbers receive filtered vent gas from the after cooler that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily N_2, O_2, and CO_2), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the carbon bed adsorbers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

4.10.9 Adsorber Outlet Filter (PVP-FILT-00001)

The adsorber outlet filter (PVP-FILT-00001) associated with this system is a miscellaneous unit located in the carbon bed adsorber room (P-0328) adjacent to the filter cave. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; this room has an SPC, but no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The adsorber outlet filter is a medium efficiency filter that is part of the VOC abatement process, which removes vapor phase organic compounds from the PVP vent gas. The abatement process takes place within an oxidation system (PVP-OXID-00001 and PVP-CLR-00001) followed by an adsorption system (PVP-ABS-00001A/B and PVP-FILT-00001). In order to prevent carbon fines (dust) emissions to the exhaust fans and PVV stack, a dust filter (PVP-FILT-00001) is provided downstream of the vessel vent carbon bed adsorbers.

The adsorber outlet filter housing and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the vent gas for a 40-year life.

4.10.9.1 Design Standards

The adsorber outlet filter (PVP-FILT-00001) is housed in a vessel fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The adsorber outlet filter vessel has the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.9.2 Characteristics of the Waste

The adsorber outlet filter receives filtered vent gas from the carbon bed absorbers that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily N_2, O_2, and CO_2), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the adsorber outlet filter is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

4.10.10 PVV Exhaust Fans (PVV-FAN-00001A/B)

The PVV exhaust fans (PVV-FAN-00001A/B) associated with this system are miscellaneous units located in the PJV fan room (P-0433), which is equipped with an SPC. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; there are no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The PVV exhaust fans are located downstream of the VOC abatement equipment in the PVP to draw treated exhausts through the HEPA filters and the components of the PVP.

The PVV exhaust fans are made of stainless steel and have some components with a 10-year life.

4.10.10.1 Design Standards

The PVV exhaust fans (PVV-FAN-00001A/B) are a vendor package and are designed in accordance with ASME AG-1.

4.10.10.2 Characteristics of the Waste

The PVV exhaust fans receive filtered vent gas from the VOC abatement process or directly from the PVV HEPA filters that is approximately 95.1 wt% water vapor, 4.9 wt% gases (primarily N_2, O_2, and CO_2), and less than 0.1 wt% solids (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PVV/PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PVV exhaust fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

4.10.11 PVP Bulges (PVP-BULGE-00001, PVP-BULGE-00002, PVP-BULGE-00014, PVP-BULGE-00019, PVP-BULGE-00020, and PVP-BULGE-00021)

The two valve bulges associated with the PVP (PVP-BULGE-00001 and PVP-BULGE-00002) are located on the 0-ft elevation level, adjacent to black cells, in rooms P-0105 and P-0101A. Each room is equipped with an SPC and floor drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. The SPC covers the room floor and perimeter curbing. The valve bulges for the PVP provide secondary containment away from the black cells and hot cell, where the control valves and valve actuators are accessible for maintenance. Rooms P-0105 and P-0101A have a radiological area classification of R3/C3 (Table 6).

A vessel vent heat exchanger bulge associated with the PVP (PVP-BULGE-00014) is located on the 56-ft elevation level in room P-0302, which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 56-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20 minutes of fire water sprinkler discharge. The vessel vent heat exchanger bulge provides secondary containment away from the filter cave, where the control valves and valve actuators are accessible for maintenance. Room P-0302 has a radiological area classification of R3/C3 (Table 6).

Three high point vent bulges associated with the PVP (PVP-BULGE-00019 through PVP-BULGE-00021) plus two high point vent bulges associated with the demineralized water system (DIW) (DIW-BULGE-00001 and DIW-BULGE-00002) are located on the 56-ft elevation level in rooms P-0303B, P-0303C, P-0320, or the 77-ft elevation level in room P-0430. These bulges provide hydrogen mitigation in the PTF. The rooms on the 56-ft elevation level have a radiological area classification of R3/C3. Room P-0430 has a radiological area classification of R2/C3.

The bulges and manual valves are made of stainless steel 316L (UNS S31603) to ensure containment of the wastes for a 40-year life.

4.10.11.1 Design Standards

The PVP bulge design follows the standard bulge design used throughout the WTP Project as described in the document 24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*. Bulge confinement is designed to meet the requirements of ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities (PVP-BULGE-00001, PVP-BULGE-00002, PVP-BULGE-00019, PVP-BULGE-00020, and PVP-BULGE-00021) or AISC M016-89, Manual of Steel Construction (PVP-BULGE-00014). The associated PVP process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.10.11.2 Characteristics of the Waste

The PVP caustic scrubber transfer pump bulge (PVP-BULGE-00001) houses the scrubber recirculation pumps (PVP-PMP-00001A/B) and transfers scrubber effluent from the PVP caustic scrubber (PVP-SCB-00002) to the plant wash vessel (PWD-VSL-00044). The HEME drain vessel pump bulge (PVP-BULGE-00002) houses the HEME drain transfer pumps and transfers radioactive condensate to the plant wash vessel (PWD-VSL-00044). The vessel vent heat exchanger bulge (PVP-BULGE-00014) houses the scrubbing liquid cooler (PVP-HX-00002).

The materials of construction for pump and heat exchanger bulges are compatible with the waste managed in the PVP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PVP bulges are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the bulges. The high point vent hydrogen mitigation bulges (PVP-BULGE-00019 through PVP-BULGE-00021, and DIW-BULGE-00001 and DIW-BULGE-00002) will undergo periodic assessment in the same manner as for PVP pump and heat exchanger bulges.

4.11 Pulse Jet Ventilation System

The PJV provides the containment and confinement of vent exhausts from various RFDs and PJMs operating inside the PTF process tanks. The system consists of process treatment and HVAC equipment, controls, instrumentation, piping, and accessories for the exhausts from RFD and PJMs operating inside various process tanks in the PTF. The PJV is housed on the 56-ft elevation level in the filter cave (P-0335) or in accessible areas on the 56-ft and 77-ft elevation levels. Note that tank PJV-VSL-00002 listed in the DWP, which was to have been located in a black cell (P-0102), has been eliminated from the PTF design. The two associated PJV drain transfer pumps (PJV-PMP-00001A/B) and the PJV drain pump bulge (PJV-BULGE-00001) have also been eliminated from the PTF design.

4.11.1 PJV Demisters (PJV-DMST-00002A/B/C)

The PJV demisters (PJV-DMST-00002A/B/C) associated with this system are miscellaneous units located in the filter cave (P-0335). The filter cave has miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.) This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a

maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6).

The demisters receive exhaust from the RFD/PJV inlet header and sub-headers and are used to remove fine aerosols and mist. They are passive devices with low maintenance requirements and high reliability.

The PJV demisters and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the exhaust for a 40-year life.

4.11.1.1 Design Standards

The PJV demisters (PJV-DMST-00002A/B/C) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The demisters have ASME flanged and dished heads with an approximate 8-ft inside diameter and a 12-ft, 6-inch tangent to tangent length. The housing vessel thicknesses are 0.750-inch (shell) and 0.500-inch minimum heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.11.1.2 Characteristics of the Waste

The PJV demisters receive PJV exhaust vapor that is approximately 99.9 wt% water vapor and 0.1 wt% gases (primarily N_2, O_2, and CO_2) (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV exhaust system. Assessment for the PJV demisters located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PJV demisters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

4.11.2 PJV Primary and Secondary Exhaust HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G and PJV-HEPA-00002A/B/C/D/E/F)

The PJV primary exhaust HEPA filters (PJV-HEPA-00001A/B/C/D/E/F/G) associated with this system are miscellaneous units located in the filter cave (P-0335). The HEPA filters, which are dry off-gas equipment and are not required to have secondary containment, sit on concrete. However, the filter cave has other miscellaneous units contained within separate concrete bermed areas lined with stainless steel. For the bermed areas, the floor slopes to openings on the south side of the bermed area, which allows leaks to flow to black cells P-0102 and P-0102A. (Floor drains cited in the DWP have been removed from the design.) Room P-0335 has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area, or recovered remotely by external means to a maintenance area during the 40-year life of the facility (Table 6). The PJV secondary exhaust HEPA filters (PJV-HEPA-00002A/B/C/D/E/F) associated with this system are miscellaneous units located in the PJV secondary HEPA filter room (P-0431A), which is equipped with an SPC and drains to move any release or spill into the C3 floor drain collection vessel (PWD-VSL-00046), located below grade at the -19-ft elevation level. As no tanks are located on the 77-ft elevation level, the SPC covers the room floor and perimeter curbing up to the maximum height to contain 20

minutes of fire water sprinkler discharge. Room P-0431A has a radiological area classification of R2/C3 and is accessible during the 40-year life of the facility (Table 6).

Following removal of aerosols by the PJV demisters (PJV-DMST-00002A/B/C), the HEPA filters receive the PJV exhaust that has been mixed with a predetermined amount of pre-filtered and heated air from a C3 area in order to reduce the relative humidity of the combined exhaust stream to 70%. There are seven primary filter housings, arranged in parallel, configured in a running/standby arrangement to allow on-line filter change. The gas passes through HEPA filter housings forming two trains: a main train (PJV-HEPA-00001A/B/C/D/E and PJV-HEPA-00002A/B/C/D) used in normal operations and an auxiliary train (PJV-HEPA-00001F/G and PJV-HEPA-00002E/F) used as an installed back-up. Exhaust gases from the primary exhaust HEPA filter housings are routed to the outlet header then to the secondary exhaust HEPA filters, PJV-HEPA-00002A through F, located in a C3 ventilation area. The HEPA filter housings in each train are arranged to form primary and secondary stages of filtration.

The HEPA filter housings and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste stream for a 40-year life.

4.11.2.1 Design Standards

The PJV HEPA filters are a vendor package. The both the primary and secondary HEPA filters are radial flow-type and are installed in the vertical position in specially designed housings. The primary HEPA filter housings are designed for remote maintenance. The secondary HEPA filters are in manual safe-change housings. The housings are in designed accordance with ASME AG-1.

4.11.2.2 Characteristics of the Waste

The PJV exhaust HEPA filters receive PJV exhaust vapor from the PJV demisters, which is approximately 100 wt% water vapor (24590-WTP-M4C-V11T-00010) , and which is mixed with a predetermined amount of pre-filtered and heated air from a C3 area in order to reduce the relative humidity of the combined exhaust stream to 70% prior to entering the filters (24590-PTF-3YD-PJV-00001).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV exhaust system. Assessment for the PJV primary HEPA filters located in the filter cave is limited to remote monitoring with remote removal, decontamination, and replacement planned for the 40-year life of the facility. The secondary HEPA filters are in an accessible room. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PJV HEPA filters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, and nature of the exhaust managed in these miscellaneous units.

4.11.3 PJV Exhaust Fans (PJV-FAN-00001A/B/C)

The PJV exhaust fans (PJV-FAN-00001A/B/C) associated with this system are miscellaneous units located in the PJV fan room (P-0433), which is equipped with an SPC. The miscellaneous units in this room operate with a dry process stream and have localized containment to confine any potential leakage or spillage; there are no drains. This room has a radiological area classification of R2/C2 and is accessible during the 40-year life of the facility (Table 6).

The PJV exhaust fans are located downstream of the PJV HEPA filters to draw treated exhausts through the HEPA filters and the components of the PJV.

The PJV exhaust fans are made of stainless steel and have some components with a 10-year life.

4.11.3.1 Design Standards

The PJV exhaust fans (PJV-FAN-00001A/B/C) are a vendor package and are designed in accordance with ASME AG-1.

4.11.3.2 Characteristics of the Waste

The PJV exhaust fans receive filtered PJV exhaust vapor that is approximately 100 wt% water vapor (24590-WTP-M4C-V11T-00010).

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV exhaust system. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the PJV exhaust fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, and nature of the exhaust managed in these miscellaneous units.

4.12 Pretreatment In-Cell Handling System

The PIH comprises all handling equipment that is necessary for the maintenance of the central hot cell. The primary functions of the PIH are to transport items between the process area hot cell (room P-0123) and remote decontamination maintenance cave (RDMC) (room P-0123A), to perform any remote maintenance, and to prepare failed equipment for disposal or repair. The PIH is located on the 0-ft elevation level.

4.12.1 Decontamination Soak Tank (PIH-TK-00001)

The decontamination soak tank (PIH-TK-00001) associated with this system is located in the RDMC (P-0123A), which is equipped with a stainless steel liner, two sumps, and two sump ejectors. The stainless steel liner covers the cell floor and the perimeter walls up to a height of 18 feet (for PIH spray decontamination operations), which is more than adequate to contain the volume of the tank in the event of flooding, and forms part of the secondary containment for the tank. Sumps and sump ejectors are part of the PWD. This room has a radiological classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to the RDMC, or recovered remotely by external means to the RDMC during the 40-year life of the facility (Table 6).

The decontamination soak tank (PIH-TK-00001) is used to immerse equipment in a non-combustible decontamination solution before being shipped out in waste drums for disposal or before direct hands-on maintenance is allowed.

The decontamination soak tank and process piping have all welded construction and are made from stainless steel 316L (UNS S31603) to ensure a 40-year life.

4.12.1.1 Design Standards

The decontamination soak tank (PIH-TK-00001) is a commercial grade tank fabricated in accordance with American Petroleum Institute (API) 650 Appendix J (shop built tanks) and Appendix S (material properties and modified equations for the analysis of stainless steel tanks). The tank has an 8-ft diameter with an overall 4-ft, 7-inch height. Tank walls have a minimum 0.500-inch thickness. Corrosion allowance is the minimum 0.040-inch standard; there is no erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.12.1.2 Characteristics of the Waste

The contents of the decontamination soak tank are primarily demineralized water and nitric acid spray (nominal 0.5 molar nitric acid). Contents may have a pH of less than 7.0 under routine operating conditions (24590-PTF-N1D-PIH-P0001).

The materials of construction for this tank are compatible with the waste managed in the PIH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the decontamination soak tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste.

4.13 Plant Wash and Disposal System

The PWD receives effluent for storage, neutralization, and transfer to evaporation systems. The effluent includes plant wash from pretreatment process tanks and sumps, acidic and alkaline effluent generated during pretreatment operations, and solids wash permeate from ultrafiltration. The PWD also receives plant wash from the HLW and LAW vitrification facilities, HLW SBS condensate vessels, as well as wastes from the analytical laboratory. The PWD is located primarily on the 0-ft elevation level in hot cells (P-0104 and P-0109) or on the -19-ft and -45-ft elevation levels.

4.13.1 Acidic/Alkaline Effluent Vessels (PWD-VSL-00015 and PWD-VSL-00016) and Breakpots (PWD-BRKPT-00015 and PWD-BRKPT-00016)

The two acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016) associated with this system are located in the acidic/alkaline effluent collection black cell (P-0109), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6). Acidic and alkaline effluent is received, stored, and neutralized in acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016) prior to transfer. Neutralized high-activity effluent is transferred to the feed preparation vessels (FEP-VSL-00017A/B) and neutralized low-activity effluent is transferred to the plant wash vessel (PWD-VSL-00044). This transfer is only done should these tanks need to be cleaned out. The only way to make this transfer is by installing a steam ejector that is normally not installed. Each acidic/alkaline effluent vessel is equipped with remote sampling capability. The maximum capacity of each tank is 119,150 gallons.

PWD ancillary equipment associated with the acidic/alkaline effluent vessels includes the following:

- two breakpots (PWD-BRKPT-00015 and PWD-BRKPT-00016), each with a total volume of 288 gallons
- six charge vessels for each tank (PWD-VSL-00101 through PWD-VSL-00106; PWD-VSL-00111 through PWD-VSL-00116)
- eight PJMs for each tank (PWD-PJM-00001 through PWD-PJM-00008; PWD-PJM-00011 through PWD-PJM-00018)
- eight jet pump pairs for each tank (PWD-EJCTR-00001 through PWD-EJCTR-00008; PWD-EJCTR-00011 through PWD-EJCTR-00015, PWD-EJCTR-00017, PWD-EJCTR-00018, and PWD-EJCTR-00151)
- six RFD ejectors for each tank (PWD-EJCTR-00101 through PWD-EJCTR-00106; PWD-EJCTR-00111 through PWD-EJCTR-00116)
- six RFDs for each tank (PWD-RFD-00101 through PWD-RFD-00106; PWD-RFD-00111 through PWD-RFD-00116)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer neutralized effluent to the FEP feed preparation vessels (FEP-VSL-00017A/B) or the ASX. Each RFD is connected to an ejector located outside the tank. Vessel-emptying ejectors, located external to the tank, are used to empty the tanks and to transfer low-activity effluent to the plant wash vessel.

The breakpots, located at the 56-ft elevation level in black cell P-0109, receive acid/caustic effluent from the treated ultrafiltration feed vessels (UFP-VSL-00002A/B), which drains by gravity to the PWD acidic/alkaline effluent vessels.

The tanks, breakpots, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.13.1.1 Design Standards

The acidic/alkaline effluent vessels (PWD-VSL-00015 and PWD-VSL-00016) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The acidic/alkaline effluent vessels have ASME 2:1 elliptical heads with an approximate 22-ft inside diameter and a 34-ft, 7-inch tangent to tangent length. The tank thicknesses are 1-inch minimum shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the 0.024-inch corrosion allowance and 0.016-inch erosion allowance required for these tanks), plus additional localized protection required for bottom head to accommodate PJM discharge required for these tanks. The additional protection for PWD-VSL-00015 is a 0.093-inch erosion allowance, and additional protection for PWD-VSL-00016 is a 0.077-inch erosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The acidic/alkaline effluent vessels include the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location.

4.13.1.2 Characteristics of the Waste

The acidic/alkaline effluent vessels receive and neutralize effluent streams from the UFP, CXP, and CNP. Contents are approximately 70 to 100 wt% water and up to 30 wt% dissolved solids with pH ranging from 0.3 to 14 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-PWD-P0003).

The materials of construction for these tanks and ancillary equipment are compatible with the waste managed in the PWD. Assessment for these tanks that are located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the acidic/alkaline effluent vessels are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.13.2 Plant Wash Vessel (PWD-VSL-00044) and Breakpots (PWD-BRKPT-00007 through 00010, PWD-BRKPT-00017, and PWD-BRKPT-00019)

The plant wash vessel (PWD-VSL-00044) associated with this system is located in the ultrafiltration black cell (P-0104), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The plant wash vessel receives rinsed or flushed dilute high-activity plant wash and recycles including PTF HEME drains, demister drains, spent scrubber solution from the PVP, contaminated effluent from the LAW vitrification facility, laboratory drains and flushes, and waste from the HLW vitrification facility via PWD-VSL-00043. During non-routine operations, the plant wash vessel may also receive plant washings from tank internals and from cell exterior surfaces. The plant wash vessel is sized to receive washes from the largest potential wash and still be able to handle routine transfers from other sources. The plant wash vessel is equipped with remote sampling capability. The maximum capacity of the tank is 103,024 gallons.

PWD ancillary equipment associated with the plant wash vessel includes the following:

- six breakpots (PWD-BRKPT-00007 through 00010, PWD-BRKPT-00017, and PWD-BRKPT-00019), each with a total volume of 175 gallons
- six charge vessels (PWD-VSL-00121 through 00126)
- eight PJMs (PWD-PJM-00021 through 00028)
- eight jet pump pairs (PWD-EJCTR-00021 through 00028)
- six RFDs (PWD-RFD-00121 through 00126)
- six RFD ejectors (PWD-EJCTR-00121 through 00126)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer samples to the ASX or to transfer effluent to the waste feed preparation vessels (FEP-VSL-00017A/B). Each RFD is connected to an ejector located outside the tank. A vessel-emptying ejector, installed from the UFP end, is used to empty the tank and to transfer low-activity effluent to acidic/alkaline effluent vessel (PWD-VSL-00016). This vessel-emptying ejector is normally not installed and is used only when PWD-VSL-00044 needs to be cleaned out.

During non-routine operations, the plant wash vessel receives plant washes by gravity drain via breakpots. Two breakpots (PWD-BRKPT-00007 and PWD-BRKPT-00019) are located at the56-ft elevation level in black cell P-0113. Four breakpots (PWD-BRKPT-00008 through 00010 and PWD-BRKPT-00017) are located at the 28-ft elevation level in black cell P-0104.

The tank, breakpots, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste feed for a 40-year life.

4.13.2.1 Design Standards

The plant wash vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME 2:1 semi-elliptical heads with an approximate 23-ft inside diameter and a 26-ft, 6-inch tangent to tangent length. The tank thicknesses are 0.875-inch shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.067-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The plant wash vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles

Piping in the transfer lines that convey dangerous waste from the LAW and HLW vitrification facilities to the plant wash vessel is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00013 and PWD-LDB-00019).

4.13.2.2 Characteristics of the Waste

The plant wash vessel receives plant wash that is typically 100 wt% water, with a pH of 10 to 11 (24590-PTF-N1D-PWD-P0001). However, this tank is also designed to receive material from PWD-VSL-00033, which can have a pH from 0.2 to 14, and material from all of the hot cell/black cell sumps.

The materials of construction for this tank are compatible with the waste managed. Assessment for this tank located in a black cell is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.13.3 Ultimate Overflow Vessel (PWD-VSL-00033)

The ultimate overflow vessel (PWD-VSL-00033) associated with this system is located in the overflow vessel pit (P-B003), which is equipped with a stainless steel liner, a sump, and two sump ejectors. Room P-B003, along with room P-B002, is located in the -45-ft elevation pit. The two rooms are connected by a 3-ft wide by 8-ft, 6-inch high opening and share a sump and sump ejectors. The stainless steel liner, which forms part of the secondary containment for the tank, covers the room floor and the perimeter walls up to the maximum height to contain the highest liquid level (-23-feet elevation) resulting from flooding due to failure of the largest tank in the black cell and hot cell containment area. In addition, the stainless steel liner extends upward an additional 2 feet to accommodate secondary containment of the piping tunnels (rooms P-B001 and P-B004) that are connected to the -45-ft elevation pit at the -21-ft elevation level. Room P-B003 has a radiological area classification of R5/C5 and is designed for limited remote access during the 40-year life of the facility (Table 6).

The ultimate overflow vessel receives and transfers routine effluent from other line drains and pit sump PWD-SUMP-00040. The ultimate overflow vessel also receives overflows from vessels throughout the PTF, which are non-routine activities. The maximum capacity of the tank is 41,650 gallons.

PWD ancillary equipment associated with the ultimate overflow vessel includes the following:

- two charge vessels (PWD-VSL-00131 through 00132)
- eight PJMs (PWD-PJM-00031 through 00038)
- eight jet pump pairs (PWD-EJCTR-00031 through 00038)
- two RFD ejectors (PWD-EJCTR-00131 through 00132)
- two RFDs (PWD-RFD-00131 through 00132)
- one vessel-emptying ejector (PWD-EJCTR-00120)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer the effluent from PWD-VSL-00033 to PWD-VSL-00044. A vessel-emptying ejector is used for non-routine transfers to the plant wash vessel (PWD-VSL-00044) via the breakpot drain header. Each RFD is connected to an ejector located outside the tank.

The contents of PWD-VSL-00033 cannot be sampled directly but can be sampled in PWD-VSL-00044, if needed, to verify the operating chemistry in PWD-VSL-00033. Collection of samples can be performed by lowering the PWD-VSL-00044 vessel level to the minimum operating volume, transferring the contents from PWD-VSL-00033 to PWD-VSL-00044, and then sampling the contents in PWD-VSL-0044.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste for a 40-year life.

4.13.3.1 Design Standards

The ultimate overflow vessel (PWD-VSL-00033) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME flanged and dished heads with an approximate 24-ft inside diameter and a 7-ft, 5-inch tangent to tangent length. The tank thicknesses are 1-inch shell and heads (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance (which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance), plus additional 0.083-inch localized protection required for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The ultimate overflow vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

Piping in the transfer lines that convey dangerous waste from the LAW and HLW vitrification facilities to the plant wash vessel is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00010 and PWD-LDB-00019).

4.13.3.2 Characteristics of the Waste

The ultimate overflow vessel receives numerous streams, mainly highly basic (pH of 13 to 14), with the exception of the RDP and CNP component streams which can be as low as pH of 0.2 (24590-PTF-3YD-PWD-00001).

The materials of construction for this tank are compatible with the waste managed. Assessment for this tank located in the -45-ft elevation pit is limited to remote monitoring and limited remote access for the 40-year life of the facility. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.13.4 HLW Effluent Transfer Vessel (PWD-VSL-00043)

The HLW effluent transfer vessel (PWD-VSL-00043) associated with this system is located in the HLW drain vessel pit (room P-B002), which is equipped with a stainless steel liner, a sump, and a sump ejector. Room P-B002, along with room P-B003, is located in the -45-ft elevation pit. The two rooms are connected by a 3-ft wide by 8-ft, 6-inches high opening and share a sump with two sump ejectors. The stainless steel liner, which forms part of the secondary containment for the tank, covers the room floor and the perimeter walls up to the maximum height to contain the highest liquid level (-23-feet elevation) resulting from flooding due to failure of the largest tank in the black cell and hot cell containment area. In addition, the stainless steel liner extends upward an additional 2 feet to accommodate secondary containment of the piping tunnels (rooms P-B001 and P-B004) that are connected to the -45-ft elevation pit at the -21-ft elevation level. This room has a radiological area classification of R5/C5 and is designed for limited remote access during the 40-year life of the facility (Table 6).

The HLW effluent transfer vessel receives and stores waste from the HLW vitrification facility, pit sump (PWD-SUMP-00040), and various line drains. The maximum capacity of the tank is 41,650 gallons.

PWD ancillary equipment associated with the HLW effluent transfer vessel includes the following:

- two charge vessels (PWD-VSL-00141 and PWD-VSL-00142)
- eight PJMs (PWD-PJM-00041 through 00048)
- eight jet pump pairs (PWD-EJCTR-00041 through 00048)
- two RFD ejectors (PWD-EJCTR-00141 and PWD-EJCTR-00142)
- two RFDs (PWD-RFD-00141 and PWD-RFD-00142)
- one vessel-emptying ejector (PWD-EJCTR-00119)

The PJMs are used to blend and maintain solids suspension. Each PJM is connected to a jet pump pair located outside the tank, but within the black cell. Charge vessels located within the parent tank are used in conjunction with the RFDs. RFDs, located within the tank, are used to transfer the effluent from vessel PWD-VSL-00043 to PWD-VSL-00044. A vessel-emptying ejector is used for non-routine transfers to the plant wash vessel (PWD-VSL-00044) via the breakpot drain header. Each RFD is connected to an ejector located outside the tank. Vessel-emptying ejectors, located external to the tank, are used to empty the tanks and to transfer low-activity effluent to the plant wash vessel.

The contents of PWD-VSL-00043 cannot be sampled directly but can be sampled in PWD-VSL-00044, if needed, to verify the operating chemistry in PWD-VSL-00043. Collection of samples can be performed by lowering the PWD-VSL-00044 vessel level to the minimum operating volume, transferring the

contents from PWD-VSL-00043 to PWD-VSL-00044, and then sampling the contents in PWD-VSL-0044.

The tanks, seal pot, and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the waste for a 40-year life. Steam ejector/high temperature components, located inside the tank, are made of Alloy C-22 (UNS N06022).

4.13.4.1 Design Standards

The HLW effluent transfer vessel (PWD-VSL-00043) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME flanged and dished heads with an approximate 24-ft inside diameter and a 7-ft, 5-inch tangent to tangent length. The tank thicknesses are 1-inch shell and heads (top and bottom), with a 2-inch minimum ASME code straight flange (top and bottom). Thicknesses include the a non-standard 0.080-inch corrosion allowance, which is adequate for the required 0.024-inch corrosion allowance and 0.016-inch erosion allowance, and eliminates the need for additional localized protection for bottom head to accommodate PJM discharge velocities required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The HLW effluent transfer vessel includes the following tank internals, which are of a standard design with no moving parts:

- PJMs
- charge vessels
- RFDs
- vessel spray nozzles
- level, density, and temperature instrumentation

Piping in the transfer lines that convey dangerous waste from the LAW and HLW vitrification facilities to the plant wash vessel is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00008 through 00009, and PWD-LDB-00011).

4.13.4.2 Characteristics of the Waste

The HLW effluent transfer vessel receives HLW streams with a near neutral pH of 8 (24590-PTF-N1D-PWD-P0002.

The materials of construction for this tank are compatible with the waste managed. Assessment for this tank located in the -45-ft elevation pit is limited to remote monitoring and limited remote access for the 40-year life of the facility. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.13.5 C3 Floor Drain Collection Vessel (PWD-VSL-00046)

The C3 floor drain collection vessel (PWD-VSL-00046) associated with this system is located in the C2/C3 floor drain collection vessel room (P-B005), which is equipped with an SPC, a sump, and sump pump. The SPC covers the room floor and perimeter walls up to the maximum height to contain 30 minutes of fire water sprinkler discharge from the C2 and C3 areas of the PTF. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The C3 floor drain collection vessel receives C3 area wastes, sample wastes, and transfer waste from PTF floor drains. Tank contents are typically transferred to RLD-VSL-00017A/B using the PWD transfer pumps (PWD-PMP-00024A/B). However, if sampling indicates that the material meets the balance of the facility non-radioactive liquid waste disposal acceptance criteria, contents are transferred to PWD-VSL-00045. The C3 floor drain collection vessel is equipped with remote sampling capability. The maximum capacity of the tank is 4,982 gallons.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the liquid waste for a 40-year life.

4.13.5.1 Design Standards

The C3 floor drain collection vessel (PWD-VSL-00046) is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The C3 floor drain collection vessel has ASME 2:1 semi-elliptical heads with an approximate 7-ft inside diameter and a 10-ft, 6-inch tangent to tangent length. The tank thicknesses are 0.4375-inch minimum shell and heads (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is approximately 40% more than the 0.024-inch corrosion allowance plus 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

4.13.5.2 Characteristics of the Waste

The C3 floor drain collection vessel receives floor drain effluent that is typically 100 wt% water (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-PWD-P0006).

The materials of construction for this tank are compatible with the waste managed. The schedule for conducting periodic assessments of this tank is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

4.13.6 Secondary Containment (PWD-SUMP-00001 through -00013, PWD-SUMP-00001A and -00002A, PWD-SUMP-00026, PWD-SUMP-00028, PW-SUMP-29, PWD-SUMP-00031 through -00036, PWD-SUMP-00040, and PWD-SUMP-00071)

The PTF tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The 56 tanks located inside the PTF building include 54 tanks in stainless steel-lined cells or rooms, and two tanks in rooms lined with an SPC; all of which are located on the 0-ft elevation level or below grade (-19-ft and -45-ft elevation levels). Each stainless steel-lined cell or room and one of the SPC-lined rooms includes one or more sumps embedded in the floor.

Sumps in the stainless steel-lined black cells on the 0-ft elevation level include:

- sumps PWD-SUMP-00001, PWD-SUMP-00001A, PWD-SUMP-00002, and PWD-SUMP-00002A in each of the feed receipt black cells (P-0108, P-0108A, P-0108B, and P-0108C)
- sump PWD-SUMP-00003 in the feed evaporator/ultrafiltration black cell (P-0106)
- sump PWD-SUMP-00004 in the ultrafiltration black cell (P-0104)
- sumps PWD-SUMP-00005 and PWD-SUMP-00006 in the HLW storage black cell (P-0102) and HLW receipt and blending black cell (P-0102A)
- sump PWD-SUMP-00007 in the acidic/alkaline effluent collection black cell (P-0109)
- sumps PWD-SUMP-00008 and PWD-SUMP-00009 in the cesium IX black cell (P-0111) and resin disposal/CNP evaporator process black cell (P-0112)
- sump PWD-SUMP-00010 in the reserved space black cell (P-0113) (although this room contains no tanks or miscellaneous units, it is part of the secondary containment for postulated flooding associated with tanks in adjoining black cells)
- sump PWD-SUMP-00011 in the treated LAW collection black cell (P-0114)
- sumps PWD-SUMP-00012 and PWD-SUMP-00013 in the treated LAW evaporator and concentrate storage black cells (P-0117 and P-0117A)

Sumps on the 0-ft elevation level in the remotely-accessible stainless steel-lined hot cell and RDMC include:

- sumps PWD-SUMP-00026, PWD-SUMP-00028, and PWD-SUMP-00029 in the hot cell (P-0123)
- sumps PWD-SUMP-00032 and PWD-SUMP-00033 in the RDMC (P-0123A).

Sumps on the 0-ft elevation level in accessible rooms with stainless steel liners include:

- sump PWD-SUMP-00031 in the spent resin dewatering equipment room (P-0119)
- sump PWD-SUMP-00036 in the alkaline effluent collection area (P-0118)

There are two additional sumps (PWD-SUMP-00034 and PWD-SUMP-00035) on the 0-ft elevation level in rooms (P-0121A and P-0122A) that do not contain DWP-regulated tanks or miscellaneous units.

Two sumps are located below grade:

- sump PWD-SUMP-00040 serves two connected stainless steel-lined rooms (P-B002 and P-B003) in the HLW drain/overflow vessel pit at the -45-ft elevation level
- sump PWD-SUMP-00071 is located at the -19-ft elevation level in the C2/C3 floor drain collection vessel room (P-B005), which has an SPC

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Secondary containment in the PTF black cells and hot cell area located on the 0-ft elevation level is designed with hydraulic connections. The purpose of these connections is to allow large amounts of fluid

to move from the black cells into the hot cell and subsequently drain into the below grade HLW effluent transfer vessel (PWD-VSL-00043) and the ultimate overflow vessel (PWD-VSL-00033) in the -45-ft elevation pit. The size of the postulated flood is defined as the total volume (capacity of the shell and both heads) of the largest vessel in the containment area. If a large volume leak were to occur, the spill will spread into each room of the black cell containment areas before eventually spreading into the hot cell.

Cell-to-cell hydraulic connections in the PTF have been placed to create the following three black cell containment areas:

- the cells containing the FRP vessels: P-0108, P-0108A, P-0108B, and P-0108C
- the cells on the south side of the hot cell: P-0102, P-0102A, P-0104, and P-0106
- the cells on the north side of the hot cell: P-0109, P-0111, P-0112, P-0113, P-0114, P-0117, and P-0117A.

With a few exceptions, all of the sumps are located in rooms that have a radiological area classification of R5/C5 (Table 6) with either no cell access or limited remote access during normal operations. The exceptions are the accessible rooms P-0119, P-0121A, and P-0122A that have a radiological classification of R5/C5/R3/C3 and P-0118 and P-B005 that have a radiological area classification of R3/C3 (Table 6).

The 24 sumps on the 0-ft elevation level are provided with radar-type liquid level detection and an ejector that discharges liquid from the sump to the plant wash vessel (PWD-VSL-00044). The sump at the -19-ft elevation level is provided with radar-type liquid level detection and an ejector that discharges liquid from the sump to the floor drain collection vessel (PWD-VSL-00045). The sump at the -45-ft elevation level is provided with a bubbler-type level detection and two ejectors that transfer the sump contents to the ultimate overflow vessel (PWD-VSL-00033) and the HLW effluent transfer vessel (PWD-VSL-00043).

The 19 sumps in the black cells and rooms P-0118, P-0119, P-0121A, and P-0122A are fabricated from stainless steel 304L (UNS S30404) and the 5 sumps in the hot cell and RDMC are fabricated from stainless steel 316L (UNS S31603) to ensure containment of any liquid waste for a 40-year life. The sump in the -45-ft elevation pit is fabricated from 6% molybdenum alloy (UNS N08367). The sump in the C2/C3 floor drain collection vessel room (P-B005) has an SPC.

4.13.6.1 Design Standards

The 26 PWD sumps in the PTF are dry sumps. All stainless steel sumps are fabricated in accordance with design methodology specified in American National Standards Institute/American Institute for Steel Construction Inc. (ANSI/AISC) N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The 24 sumps on the 0-ft elevation level are 30 inches in diameter by 28 inches deep, and the C2/C3 floor drains collection vessel room sump is 30 inches in diameter by 18 inches deep. The sump in the -45-ft elevation pit is rectangular with dimensions of 60 inches long by 30 inches wide by 30 inches deep.

4.13.6.2 Characteristics of the Waste

During normal operations, the PTF sumps are dry. The sumps, in combination with the stainless steel or SPC liners, provide secondary containment for wastes from the following DWP-regulated tanks and miscellaneous units, and drains:

- waste feed receipt vessels FRP-VSL-00002A/B/C/D (PWD-SUMP-00001, PWD-SUMP-00001A, PWD-SUMP-00002, PWD-SUMP-00002A)
- waste feed evaporator feed vessels FEP-VSL-00017A/B and separators FEP-SEP-00001A/B; and ultrafiltration feed preparation vessel UFP-VSL-00001A and permeate vessels UFP-VSL-00062A/B (PWD-SUMP-00003)
- ultrafiltration feed preparation vessel UFP-VSL-00001B, feed vessels UFP-VSL-00002A/B, and permeate vessel UFP-VSL-00062C; caustic scrubber PVP-SCB-00002; and plant wash vessel PWD-VSL-00044 (PWD-SUMP-00004)
- HLW feed receipt vessel HLP-VSL-00022 and feed blending vessel HLP-VSL-00028; and HEME drain collection vessel PVP-VSL-00001 (PWD-SUMP-00005)
- HLW lag storage vessels HLP-VSL-00027A/B (PWD-SUMP-00006)
- acidic/alkaline effluent vessels PWD-VSL-00015 and PWD-VSL-00016 (PWD-SUMP-00007)
- cesium IX feed vessel CXP-VSL-00001, reagent vessel CXP-VSL-00005, and caustic rinse collection vessel CXP-VSL-00004; and eluate contingency vessel CNP-VSL-00003 (PWD-SUMP-00008)
- cesium evaporator eluant lute pot CNP-VSL-00001, separator CNP-EVAP-00001, and recovered nitric acid vessel CNP-VSL-00004; and spent resin slurry vessels RDP-VSL-00002A/B/C (PWD-SUMP-00009)
- cesium IX treated LAW vessels CXP-VSL-00026A/B/C (PWD-SUMP-00011)
- LAW SBS condensate receipt vessel TLP-VSL-00009A and evaporator separator vessel TLP-SEP-00001 (PWD-SUMP-00012)
- LAW SBS condensate receipt vessel TLP-VSL-00009B and concentrate storage vessel TCP-VSL-00001 (PWD-SUMP-00013)
- waste feed evaporator reboilers FEP-RBLR-00001A/B; ultrafilters UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B; cesium IX columns CXP-IXC-00001 through CXP-IXC-00004; cesium evaporator concentrate reboiler CXP-HX-00001; treated LAW evaporator reboilers (PWD-SUMP-00026, PWD-SUMP-00028, and PWD-SUMP-00029)
- spent resin dewatering moisture separation vessel RDP-VSL-00004 (PWD-SUMP-00031)
- decontamination soak tank PIH-TK-00001 (PWD-SUMP-00032 and PWD-SUMP-00033)
- treated LAW evaporator condensate vessel TLP-VSL-00002 and RLD-VSL-00017A/B (PWD-SUMP-00036)
- ultimate overflow vessel PWD-VSL-00033 and HLW effluent transfer vessel PWD-VSL-00043 (PWD-SUMP-00040)
- C3 floor drain collection vessel PWD-VSL-00046 (PWD-SUMP-00071)

Previous sections describe the materials managed in the tanks, miscellaneous units, and associated piping. The materials of construction for secondary containment system are compatible with the waste managed

in the PTF. Assessment for sumps located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. Assessment for sumps located in hot cells is limited to remote monitoring with remote maintenance and decontamination planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each cell or room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same cell or room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

For the purposes of integrity assessment, sump PWD-SUMP-00036 is used as a surrogate for inaccessible sumps in the PTF. Therefore, the frequency of the integrity assessment of this sump is accelerated to be consistent with the frequency for sumps with higher potential for corrosion and erosion (Table 7).

4.14 Radioactive Liquid Waste System

The PTF RLD receives evaporator overhead condensate for recycle as process condensate and LAW caustic scrubber waste for transfer to the LERF/ETF or back to evaporation depending on sample analysis. Excess process condensate is also transferred to the LERF/ETF. The RLD is located on the 0-ft elevation level in accessible rooms and in the P-0150 area located outside of the PTF building.

4.14.1 Alkaline Effluent Vessels (RLD-VSL-00017A/B)

The alkaline effluent vessels (RLD-VSL-00017A/B) associated with this system are located in the alkaline effluent collection area (P-0118), which is equipped with a stainless steel liner, a sump, and a sump ejector. The stainless steel liner covers the cell floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of the largest nozzle at the lowest point on the largest tank in the black cell and hot cell containment area, and forms part of the secondary containment for the DWP-regulated equipment in the black cells and hot cell. Sumps and sump ejectors are part of the PWD. This room has a radiological area classification of R3/C3 and is accessible during the 40-year life of the facility (Table 6).

The alkaline effluent vessels receive, store, and discharge low-activity alkaline and other suspect activity effluent generated within the PTF and receive caustic scrub solution from the LAW vitrification facility. Each alkaline effluent vessel is equipped with remote sampling capability. The maximum capacity of each tank is 34,340 gallons.

RLD ancillary equipment associated with the alkaline effluent vessels includes the following:

- one jet mixer for each tank (RLD-MXR-00001; RLD-MXR-00002)
- two transfer pumps (RLD-PMP-00005A/B)

The jet mixers are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. The two alkaline effluent pumps are located in room P-0118 and are used to provide recirculation to the jet mixers and to transfer tank contents.

The tanks and process piping have all welded construction and are made of stainless steel 304L (UNS S30403) to ensure containment of the waste feed for a 40-year life.

4.14.1.1 Design Standards

The alkaline effluent vessels (RLD-VSL-00017A/B) are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The alkaline effluent vessels have ASME 2:1 semi-elliptical heads (top and bottom) with an approximate 16-ft inside diameter and a 17-ft, 6-inch tangent to tangent length. The tank thicknesses are 1-inch (shell) and 1-inch minimum head (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The alkaline effluent vessels include the following tank internals, which are of a standard design with no moving parts:

- jet mixers
- vessel spray nozzles

To monitor for compliance with LERF/ETF acceptance criteria, tank contents are pumped from the tank using the alkaline effluent pumps (RLD-PMP-00005A/B) and routed to a sampler.

Piping in the transfer lines that convey dangerous waste from the LAW vitrification facility to the alkaline effluent vessels is double-walled. The material of construction for the pipes is stainless steel 316L. The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB located at the PTF pipe tunnel (room P-B001) (PWD-LDB-00012 and PWD-LDB-00015).

4.14.1.2 Characteristics of the Waste

The alkaline effluent vessels receive condensate/effluent that is 100 wt% water, with a pH approximately 13.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-P0002).

The materials of construction for these tanks are compatible with the waste managed. The schedule for conducting periodic assessments of these tanks is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.14.2 Process Condensate Tanks (RLD-TK-00006A/B)

The process condensate tanks (RLD-TK-00006A/B) associated with this system are located outside of the PTF building in the diked concrete RLD containment area (P-0150), which is equipped with an SPC, a sump, and a sump pump. The SPC covers the floor and the perimeter walls up to the maximum height to contain the highest liquid level resulting from failure of one tank plus the maximum rainfall for a 24-hour period, and forms part of the secondary containment for the tanks. This area does not have a radiological area classification and is accessible during the 40-year life of the facility (Table 6).

The process condensate tanks receive, sample, and discharge low-activity condensate/effluent. Each process condensate tank is equipped with remote sampling capability. The maximum capacity of each tank is 394,000 gallons.

RLD ancillary equipment associated with the process condensate tanks includes the following:

- one jet mixer for each tank (RLD-MXR-00003 and RLD-MXR-00004)
- six pumps (RLD-PMP-00011A/B, RLD-PMP-00012A/B, and RLD-PMP-00014A/B)

The jet mixers are used to mix, suspend solids, and maintain a homogeneous mixture for sampling and transfer. The six pumps are located inside the diked P-0150 area. The two process condensate transfer pumps (RLD-PMP-00011A/B) are used to transfer off-spec effluent to TLP-VSL-00009A/B. The two process condensate recirculation pumps (RLD-PMP-00012A/B) are used to provide recirculation to the jet mixers. The two process condensate distribution pumps (RLD-PMP-00014A/B) are used to transfer tank contents for reuse in the PTF.

The tanks and process piping have all welded construction and are made of stainless steel 316L (UNS S31603) to ensure containment of the condensate/effluent for a 40-year life.

4.14.2.1 Design Standards

The process condensate tanks (RLD-TK-00006A/B) are commercial grade tanks fabricated in accordance with the API construction standards API 650 Appendix J (shop built tanks) and Appendix S (material properties and modified equations for the analysis of stainless steel tanks). The process condensate tanks have an approximate 42-ft inside diameter and an overall 33-ft, 4-inch height. The tank thicknesses are 0.250-inch (first course shell, roof, and floor) and 0.1875-inch minimum (second course shell). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance and 0.004-inch erosion allowance required for these tanks. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

The process condensate tanks include the following tank internals, which are of a standard design with no moving parts:

- jet mixers
- vessel spray nozzles

To monitor for compliance with LERF/ETF acceptance criteria, tank contents are pumped from the tank using the process condensate transfer pumps (RLD-PMP-00011A/B) and routed to a manual sampler.

Piping in the transfer lines to and from the tanks is double-walled. The material of construction for the pipes is stainless steel 316L (UNS S31603). The transfer lines are each encased with an outer carbon steel pipe that drains to a LDB (RLD-LDB-00012 and RLD-LDB-00013).

4.14.2.2 Characteristics of the Waste

The process condensate tanks receive condensate/effluent that is 100 wt% water, with a pH of approximately 11.0 to 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-00001).

The materials of construction for these tanks are compatible with the waste managed. The schedule for conducting periodic assessments of these tanks is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

4.14.3 Secondary Containment (RLD-SUMP-00003)

The PTF tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. As described above, two of the four tanks in the RLD system are located inside the PTF building in a stainless steel-lined room (P-0118) with two PWD sumps. The remaining two RLD tanks (RLD-TK-00006A/B) are located outside the PTF building in the concrete containment area (P-0150), which is equipped with a sump (RLD-SUMP-00003). The containment area (P-0150) has no radiological area classification (Table 6).

P-0150 does not have floor drains; in the event of flooding, liquid is removed from the containment area to the alkaline effluent vessels (RLD-VSL-00017A/B) in the PTF building.

The sump in the RLD containment area is provided with radar-type liquid level detection and a pump (RLD-PMP-00191) that discharges liquid (primarily rainfall and liquid from spray wash stations) from the sump to the alkaline effluent vessels (RLD-VSL-00017A/B). The sump is a depression at the low point of the containment area measuring 78 inches by 48 inches by 36 inches deep with an epoxy SPC to ensure containment of liquid waste for a 40-year life.

4.14.3.1 Design Standards

The sump in containment area (P-0150) is a dry sump designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

4.14.3.2 Characteristics of the Waste

During normal operations, the containment area sump (RLD-SUMP-00003) is dry. The sump, in combination with the SPC, provides secondary containment for wastes from RLD-TK-00006A/B and associated pumps and piping. These two tanks receive condensate/effluent that is 100 wt% water, with a pH of approximately 11.0 to 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-00001).

The materials of construction for secondary containment system are compatible with the waste managed in the PTF RLD containment area. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction and nature of the waste managed in the system.

5 High-Level Waste Facility

This section provides detailed descriptions of the HLW vitrification facility DWP-regulated tank systems and miscellaneous unit systems. The tanks, miscellaneous units, breakpots, sumps, and piping associated with these systems are assessed periodically to confirm the integrity of their materials of construction. The WTP design incorporates the "black cell" and "hard-to-reach area" concept as a key part of the facility design for the PTF and HLW vitrification facility. For black cells, this entails locating certain equipment in shielded cells for which no maintenance or entry is planned for the 40-year design life of the plant. Hard-to-reach areas are designed for no equipment access and maintenance.

The systems in the HLW vitrification facility that contain DWP-regulated tanks and miscellaneous units are as follows:

- HLW melter feed process
- HLW melter process
- HLW melter offgas treatment process
- HLW melter cave support handling
- HLW canister decontamination handling
- pulse jet ventilation
- radioactive liquid waste disposal

For each tank, miscellaneous unit, breakpot, and sump in the HLW vitrification facility, information is provided on the location of the equipment, its purpose, and its design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for each item of equipment and the characteristics of the waste managed in each tank, miscellaneous unit, breakpot, sump, and associated piping are also provided. This information is the unit-specific baseline used to establish the approach and schedule for future integrity assessments for the HLW vitrification facility DWP-regulated equipment.

5.1 HLW Melter Feed Process System

The HFP prepares melter feed from pretreated waste and transfers it to the melters to produce a vitrified product. The process consists of mixing appropriate amounts of glass formers and additives (e.g., anti-foaming agents) with the pretreated radioactive feed concentrate and pumping the resulting slurry to two melters for vitrification.

The DWP-regulated plant items associated with the HFP are the MFPVs (HFP-VSL-00001 and HFP-VSL-00005) and MFVs (HFP-VSL-00002 and HFP-VSL-00006). Associated with Melter 1 are vessels HFP-VSL-00001 and HFP-VSL-00002, located in a melter cave (room H-0117) on the 0-ft elevation level. Associated with Melter 2 are vessels HFP-VSL-00005 and HFP-VSL-00006, located in the second melter cave (room H-0106) on the 0-ft elevation level.

5.1.1 Melter Feed Preparation Vessels (HFP-VSL-00001 and HFP-VSL-00005) and Melter Feed Vessels (HFP-VSL-00002 and HFP-VSL-00006)

The MFPV HFP-VSL-00001 and MFV HFP-VSL-00002 are located in melter cave room H-0117. Vessels HFP-VSL-00005 and HFP-VSL-00006 are located in melter cave room H-0106. Each room is equipped with a stainless steel liner, sump (HFP-SUMP-00002 or HFP-SUMP-00005), and sump ejector (RLD-EJCTR-00172 or RLD-EJCTR-00178). Both rooms have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

In the MFPVs, HLW concentrate (e.g., solids from ultrafiltration, Sr/TRU precipitate, Cs concentrate, and future Cs/Sr capsule waste) and glass formers from a dedicated tank, GFR-TK-00025 or GFR-TK-00031 (the GFR tanks are not located inside the melter caves), are combined to produce the melter feed slurry. The blended melter feed slurry is batch-transferred to the MFVs, where it is continuously transferred to the melters. Each of the MFPVs and MFVs has a maximum capacity of 8,370 gallons. The MFPVs and MFVs are remotely replaceable.

Each of the MFPVs is equipped with the following:

- mechanical agitator (HFP-AGT-00001 or HFP-AGT-00004)
- air spargers for purging hydrogen from head space and for agitation
- anti-foaming agent addition capability
- two mechanical pumps to transfer waste to the MFVs and to the autosampler (HFP-PMP-00005A/B or HFP-PMP-00018A/B)
- demister on the vent line for de-entrainment (HFP-DMST-00001 or HFP-DMST-00003)
- instrumentation for level, density, and pressure measurements
- thermowell for temperature measurements
- cooling jacket to remove radioactive decay heat and heat dissipated from the agitator
- internal fixed nozzles for periodic wash-downs
- steam ejector (HFP-EJCTR-0001 or HFP-EJCTR-0005) for transfer to the plant wash and drains vessel (RLD-VSL-00008)
- overflow line to sump HFP-SUMP-00002 or HFP-SUMP-00005

Each of the MFVs is equipped with the following:

- mechanical agitator (HFP-AGT-00002 or HFP-AGT-00005)
- air spargers for purging hydrogen from head space and for agitation
- anti-foaming agent addition capability
- air displacement slurry (ADS) transfer pumps (HFP-PMP-00001/HFP-PMP-00002 or HFP-PMP-00014/ HFP-PMP-00015)
- demister on the vent line for de-entrainment (HFP-DMST-00002 or HFP-DMST-00004)
- instrumentation for level, density, and pressure measurements

- thermowell for temperature measurements
- cooling jacket to remove radioactive decay heat and heat dissipated from the agitator
- internal fixed nozzles for periodic wash-downs
- steam ejector (HFP-EJCTR-0002 or HFP-EJCTR-0004) for transfer to RLD-VSL-00008
- overflow line to sump HFP-SUMP-00002 or HFP-SUMP-00005
- sample pump (HFP-PMP-00007 or HFP-PMP-00017) to transfer waste to the autosampler

The MFPVs, MFVs, internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.1.1.1 Design Standards

The MFPVs and MFVs are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These tanks have ASME flanged and dished heads (bottom head has a 77-inch-wide flat center section) with an approximate 11-ft inside diameter and a 9-ft, 6-inch tangent to tangent length. The tank shell and head thicknesses are 0.625 to 0.875-inch (shell), 0.875-inch minimum (top), and 0.750-inch minimum (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance for the top, which is adequate for the corrosion allowance with no erosion allowance. However, due to possible high velocities near the agitators, a 0.125-inch allowance is required for the bottom and shell (including both corrosion and erosion allowances) for additional localized protection. The mechanical agitators, pumps, demisters, and steam ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.1.1.2 Characteristics of the Waste

The HLW concentrate is classified as Envelope D and can include supernate classified as Envelope A, B, or C (24590-WTP-DB-ENG-01-001). The contents of the MFPVs and MFVs are HLW concentrate and glass formers. The glass formers can include silica, boric acid, lithium carbonate, zinc oxide, borax, sodium carbonate, and sucrose (24590-WTP-PSAR-ESH-01-002-04).

The MFPVs receive and blend HLW concentrate and glass formers. The MFVs receive the blended melter feed from the MFPVs prior to delivery to the melters. The blended contents are approximately 76 wt% water and 24 wt% solids with a pH of approximately 13.0 (24590-HLW-M5-V17T-P0001, 24590-WTP-M4C-V11T-00010, 24590-HLW-N1D-HFP-P0003, 24590-HLW-N1D-HFP-P0004).

The materials of construction for the MFPVs, MFVs, and ancillary equipment are compatible with the waste managed in the HFP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

5.1.2 Secondary Containment (HFP-SUMP-00001, HFP-SUMP-00002, HFP-SUMP-00004, and HFP-SUMP-00005)

The HFP tank systems and HOP miscellaneous unit systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HFP tanks

described above are located in stainless steel-lined rooms H-0106 and H-0117 with sumps HFP-SUMP-00002 and HFP-SUMP-00005 embedded in the floor. Two sumps (HFP-SUMP-00001 and HFP-SUMP-00004) are located in stainless steel-lined rooms H-0302 and H-0308 containing the HOP wet electrostatic precipitators (WESPs) (discussed in Section 5.3.4). All rooms have a radiological area classification of R5/C5 (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HFP-SUMP-00002 and HFP-SUMP-00005 are equipped with radar-type level detectors and have ejectors. Sumps HFP-SUMP-00001 and HFP-SUMP-00004 are gravity drain sumps without leak detection instrumentation; waste entering the sumps flows by gravity to the plant wash and drains vessel (RLD-VSL-00008), which has a radar level instrumentation. All sumps are fabricated with 6% molybdenum alloy (UNS N08367).

If the capacity of HFP-VSL-00001 or HFP-VSL-00002 in room H-0117 is exceeded, the excess overflows to sump HFP-SUMP-00002, which is located in the same room. Additionally, leaks from these tanks flow into the sump. An ejector (RLD-EJCTR-00172) transfers the sump contents to RLD-VSL-00008.

If the capacity of HFP-VSL-00005 or HFP-VSL-00006 in room H-0106 is exceeded, the excess overflows to sump HFP-SUMP-00005, which is located in the same room. Leaks from these tanks flow into the sump. An ejector (RLD-EJCTR-00178) transfers the sump contents to RLD-VSL-00008.

Sump HFP-SUMP-00001 is located in room H-0308 with miscellaneous unit WESP HOP-WESP-00001. Leaks from HOP-WESP-00001 flow into this sump. Additionally, if the capacity of the transfer manifold is exceeded, sump HFP-SUMP-0001 receives the overflow. The waste entering the sump flows by gravity to RLD-VSL-00008.

Sump HFP-SUMP-00004 is located in room H-0302 with HOP-WESP-00002. Leaks from HOP-WESP-00002 flow into this sump. Additionally, if the capacity of the transfer manifold is exceeded, sump HFP-SUMP-0004 receives the overflow. The waste entering the sump flows by gravity to RLD-VSL-00008.

5.1.2.1 Design Standards

Sumps HFP-SUMP-00002 and HFP-SUMP-00005 are dry sumps, with dimensions of 31.5 inches in length by 25.5 inches in width by 16 inches in depth. Sumps HFP-SUMP-00001 and HFP-SUMP-00004 are gravity drain sumps, with dimensions of 30 inches in diameter by 18 inches deep. All sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

5.1.2.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from HFP tanks (HFP-VSL-00001, HFP-VSL-00002, HFP-VSL-00005, and HFP-VSL-00006) and from HOP miscellaneous unit WESPs (HOP-WESP-00001

and HOP-WESP-00002). Previous sections and Section 5.3.4 describe the materials managed in these tanks, miscellaneous units, and associated piping. The materials of construction for secondary containment system are compatible with the waste managed in the HFP and HOP.

The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

5.2 HLW Melter Process System

The HMP is comprised of two melters, each with the same design. The melters are fed a blend of HLW concentrate and glass former additives from the MFVs. The melters convert the blended slurry into molten glass. The constituents of the HLW concentrate undergo chemical reactions, converting to their respective oxides, and dissolve in the molten glass. The molten glass is contained using heat-resistant ceramic refractory bricks. Cooling water panels are provided to cool glass within the refractory brick seams. The molten glass is poured into stainless steel canisters and allowed to cool, forming a highly durable borosilicate glass waste form. Immobilized high-level waste (IHLW) is the resulting product. The DWP-regulated plant items associated with the HMP are the melters (HMP-MLTR-00001 and HMP-MLTR-00002), which are considered miscellaneous units. These melters are located in the melter caves (rooms H-0117 and H-0106, respectively) on the 0-ft elevation level.

5.2.1 HLW Melters (HMP-MLTR-00001 and HMP-MLTR-00002)

Melters HMP-MLTR-00001 and HMP-MLTR-00002 are located in melter cave rooms H-0117 and H-0106, respectively. The area of each room containing a melter and its ancillary equipment is equipped with a stainless steel liner, sump (HSH-SUMP-00003 or HSH-SUMP-00007), and sump ejector (RLD-EJCTR-00171 or RLD-EJCTR-00179). Both rooms have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

Each melter receives and vitrifies the blended feed slurry from one of the two MFVs at a nominal feed rate of 3 MTG/day and discharges molten glass. The overall size of each of the two identical melters consist of an approximate 14-ft length, 14-ft width, and 11-ft height with an estimated weight of 89 short tons (with glass, the estimated weight is 101 short tons).

Each melter has three internal compartments: the melt chamber and two discharge chambers. The melt chamber consists of a glass pool zone sometimes referred to as the glass tank, which is lined with refractory material designed to withstand corrosion from molten glass, and a head space called the plenum, which is lined with refractory material to withstand hot corrosive gases, thermal shock, and glass and feed splatter.

The glass pool and plenum of each melter are constructed with one of the following kinds of refractory bricks supplied by Monofrax: 30 wt% chrome oxide with 60 wt% alumina (Monofrax K-3), 80 wt%

chrome oxide (Monofrax E), and 93 wt% alumina (Monofrax H). The outer wall of the glass pool consists of alumina-zirconia-silica bonded brick.

5.2.1.1 Design Standards

The confinement structures and components of the HLW melters are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII and ASME B31.3-96, Process Piping. The HLW melters are a slurry-fed, joule-heated design using Inconel 690 (UNS N06690) plate electrodes. These melters are remotely replaceable and have a minimum 5-year design life. In each melter, the walls of the glass pool are constructed in four layers, from interior to exterior:

1) glass contact refractory layer consisting of a 12-inch thick layer of Monofrax K-3
2) 5-inch thick layer of Monofrax E
3) first 3-inch thick layer of alumina-zirconia-silica bonded brick
4) second 3-inch thick layer of alumina-zirconia-silica bonded brick

The interior wall of the glass pool also contains alloy electrodes (Alloy 690, UNS N06690). The internal plenum wall refractory is a 9-inch layer of Monofrax H blocks that extend to the melter lid. The lid, which consists of three refractory layers, is part of the primary containment of the melter plenum gases and is based on previous successful designs of liquid-fed melters. Refractory corrosion rates are accounted for in the melter design.

Several replaceable melter service components (e.g., bubblers, level detectors, and thermowells) are mounted on the gas barrier lid and enter the melter by means of cylindrical ports through the shield lid. The ports of the gas barrier lid are lined with Alloy 690 sleeves.

5.2.1.2 Characteristics of the Waste

The contents of the melters are the HLW concentrate and glass formers from the MFVs (24590-WTP-PSAR-ESH-01-002-04, 24590-HLW-3YD-HMP-00001).

The materials of construction for the miscellaneous units are compatible with the waste managed in the HMP. The melters are designed to be replaced every 5 years. The schedule for conducting periodic assessments of the melters is provided in Table 7.

5.3 HLW Melter Offgas Treatment Process System and Process Vessel Vent Exhaust System

The HOP is designed to control the melter pressure, cool the melter and PVV offgas, remove radioactive particulates, and treat gaseous chemicals to permit the release of the offgas to the environment. The HOP consists of film coolers, submerged bed scrubbers (SBSs), SBS condensate receiver vessels, WESPs, HEMEs, and HEPA filters. It also includes thermal catalytic oxidizers, selective catalytic reducers, silver mordenite columns, activated carbon adsorbers, booster fans, and stack extraction fans.
The melter-lid mounted film coolers reduce the temperature of the melter offgas before it enters the SBSs. In the SBSs, offgas is drawn through the submerged packed beds. The temperature of the offgas is further reduced, and larger particles, aerosols, and soluble constituents are removed inside the SBSs. The WESPs remove additional radioactive aerosols to extend the life of downstream equipment filter media.

Offgas from the PVV, which has no DWP-regulated tanks and miscellaneous units, enters the HOP between the WESPs and HEMEs. The HEMEs remove radioactive aerosols from the melter offgas and vessel vent offgas. Condensate from the SBSs and wash water from the WESPs and HEMEs are collected in tanks and recirculated through the SBSs or transferred to the RLD. The HEPA filters remove entrained particulates by forcing the offgas through two sets of filters. The offgas from the HEPA filters passes through thermal catalytic oxidizers and selective catalytic reducers to treat the VOCs and NOx. The offgas then passes through the silver mordenite columns to remove gaseous halides, particularly iodine-129. After it passes through these columns, the offgas is further treated by activated carbon adsorbers to remove volatile mercury. The booster extraction fans are used to provide motive force to move the offgas through the HOP. After the offgas passes through the HOP treatment processes, the stack extraction fans discharge the offgas to the atmosphere through the HLW vitrification facility's exhaust stack.

The DWP-regulated plant items associated with the HOP include the following:

- melter-lid mounted film coolers (HOP-FCLR-00001 through HOP-FCLR-00004) located in rooms H-0106 and H-0117 on the 0-ft elevation level
- SBSs (HOP-SCB-00001 and HOP-SCB-00002) located in rooms H-0106 and H-0117 on the 0-ft elevation level
- SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904) located in rooms H-B005 and H-B021 on the -21-ft elevation level
- WESPs (HOP-WESP-00001 and HOP-WESP-00002) located in rooms H-0302 and H-0308 on the 37-ft elevation level
- HEMEs (HOP-HEME-00001A/B and HOP-HEME-00002A/B) located in rooms H-0106 and H-0117 on the 0-ft elevation level
- HEPA electric preheaters (HOP-HTR-00001B, HOP-HTR-00002A, and HOP-HTR-00005A/B) located in room H-0104 on the 0-ft elevation level
- HEPA filters (HOP-HEPA-00001A/B, HOP-HEPA-00002A/B, HOP-HEPA-00007A/B, and HOP-HEPA-00008A/B) located in room H-0104 on the 0-ft elevation level
- catalyst skid preheaters (HOP-HX-00001 and HOP-HX-00003) and electric heaters (HOP-HTR-00001 and HOP-HTR-00007) located in room H-A123 on the 0-ft elevation level
- thermal catalytic oxidizers (HOP-SCO-00001 and HOP-SCO-00004) and NOx selective catalytic reducers (HOP-SCR-00001 and HOP-SCR-00002) located in room H-A123 on the 0-ft elevation level
- silver mordenite preheaters (HOP-HX-00002 and HOP-HX-00004) located in room H-A123 on the 0-ft elevation level
- silver mordenite columns (HOP-ABS-00002 and HOP-ABS-00003) located in room H-B001B on the -21-ft elevation level
- activated carbon adsorbers (HOP-ADBR-00001A/B and HOP-ADBR-00002A/B) located in room H-A123 on the 0-ft elevation level
- booster extraction fans (HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C) located in room H-B001C at the -21-ft elevation level and stack extraction fans (HOP-FAN-00008A/B/C and HOP-FAN-00010A/B/C) located in room H-0429 on the 58-ft elevation level

5.3.1 Film Coolers (HOP-FCLR-00001 through HOP-FCLR-00004)

Each of the two melters has two film coolers. Melter HMP-MLTR-00001 has film coolers HOP-FCLR-00001 and HOP-FCLR-00003 located in melter cave room H-0117. Melter HMP-MLTR-00002 has film coolers HOP-FCLR-00002 and HOP-FCLR-00004 located in melter cave room H-0106. The area of each room containing film coolers is equipped with a stainless steel liner, sump (HSH-SUMP-00003 or HSH-SUMP-00007), and sump ejector (RLD-EJCTR-00171 or RLD-EJCTR-00179). Both rooms have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The primary function of the film coolers is to cool the melter offgas below the particle sticking temperature to minimize solids deposition on the film cooler and offgas piping walls. The offgas exits a melter and mixes with air in the film cooler. The film cooler is a double-walled pipe that introduces compressed air axially through a series of holes or slots in the inner wall of the film cooler. The injection of compressed air into the melter offgas also helps minimize solids build-up within the film cooler. There is the capability to add water to the film cooler inlet air. The water addition can be used periodically to flush solids build up from the air distribution slots. Use of water addition for solids cleaning may result in rapid vaporization of water to steam. Thus, the water addition rate is controlled to avoid the possibility of melter pressurization.

Each film cooler is 22 inches in diameter by 23.5 inches long, and made of Inconel 690 (UNS N06690). The film coolers are anticipated to have a service life of 5 years.

5.3.1.1 Design Standards

The film coolers are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.1.2 Characteristics of the Waste

The principal gas generated by the melter is steam. The offgas from the film coolers is approximately 13.1 wt% water, 85.7 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction of these miscellaneous units are compatible with the waste managed in the HOP. The film coolers are designed to have an operating life of 5 years. The schedule for conducting periodic assessments of this system is provided in Table 7.

5.3.2 Submerged Bed Scrubbers (HOP-SCB-00001 and HOP-SCB-00002)

The SBSs (HOP-SCB-00001 and HOP-SCB-00002) are miscellaneous units located in melter cave rooms H-0117 and H-0106, respectively. The SBS HOP-SCB-00001 is associated with Melter 1, and SBS HOP-SCB-00002 is associated with Melter 2. Rooms H-0117 and H-0106 have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The purpose of the SBSs is to remove entrained radioactive particulates from the melter offgas. The SBS contains a bed, packed with 1-inch-diameter ceramic spheres, used to quench and scrub the particulates from the melter offgas. The melter offgas enters at the bottom of the SBS through an inlet pipe that runs down through the center of the bed, travels upward through the bed, and exits through the top for further treatment by the WESPs. The bed has an approximate 6-ft diameter and 2-ft height. The bed has a slotted plate on the top to contain the bed packing, and a slotted plate with tubular risers on the bottom to facilitate two-phase flow. The level of water is held at approximately 3 inches above the bed by three overflow weirs. Scrub solution is recirculated through the SBS from the SBS condensate receiver vessel (HOP-VSL-00903 or HOP-VSL-00904) using two recycle lines, each of which is subdivided into four water jet lines. The water jet lines recirculate solution on the bottom to suspend collected solids. The solids are removed from the SBS by transferring the slurry from the bottom to the acidic waste vessel (RLD-VSL-00007) located in the RLD.

The SBS has automatically controlled cooling coils and jackets on the top, sides, and bottom that are used to cool the melter offgas to the desired discharge temperature and to regulate the scrubbing solution temperature. A spray system is installed to allow the decontamination of the SBS with demineralized water or nitric acid. Each SBS also has two vessel-emptying ejectors (HOP-EJCTR-00053A/B or HOP-EJCTR-00918A/B). Each SBS has a maximum capacity of 4,516 gallons.

Leaks from the SBSs flow to sumps HOP-SUMP-00003 and HOP-SUMP-00008 by gravity drains. HOP-SUMP-00003 and HOP-SUMP-00008 are located in rooms H-B021 and H-B005, which are located directly below rooms H-0117 and H-0106, respectively.

The SBSs, their internal components, and process piping are made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The cooling coils and jackets are made of Alloy C-22 (UNS N06022) and stainless steel 304L (UNS S30403), respectively. The ceramic spheres are made of aluminum oxide or an equivalent material. The cooling coils and jackets, packed beds, and/or entire SBSs are remotely replaceable.

5.3.2.1 Design Standards

The SBSs are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These SBSs have ASME flanged and dished heads with an approximate 12-ft inside diameter and a 5-ft, 9-inch tangent to tangent length. The shell and head thicknesses are 0.6875-inch minimum (shell), 0.6250-inch minimum (top), and 0.8750-inch minimum (bottom). Thicknesses include a 0.080-inch corrosion allowance, which is more than the minimum 0.040-inch standard corrosion allowance and adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for these miscellaneous units. The ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.2.2 Characteristics of the Waste

The SBSs remove radioactive particulates that are present in the melter offgas. The offgas from the SBSs is 8.9 wt% water, 90.0 wt% gases (primarily N_2, O_2, and CO_2), and 1.1 wt% solids. The liquid effluent from the SBSs is approximately 99 wt% water and 1 wt% solids with a pH ranging from 1.0 to 8.5 (24590-HLW-M5-V17T-P0003, 24590-WTP-M4C-V11T-00010, 24590-HLW-N1D-HOP-00010).

The materials of the SBSs and ancillary equipment are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these miscellaneous units are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the miscellaneous units.

5.3.3 SBS Condensate Receiver Vessels (HOP-VSL-00903 and HOP-VSL-00904)

The SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904) are located in black cell rooms H-B021 and H-B005, respectively. The area of each room containing a SBS condensate receiver vessel is equipped with a stainless steel liner, a sump (HOP-SUMP-00003 or HOP-SUMP-00008), and two sump ejectors (RLD-EJCTR-00053A/B or RLD-EJCTR-00176A/B). Both rooms have a radiological area classification of R5/C5 and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The SBS condensate receiver vessels collect condensate generated by the SBSs and condensate and wash solutions generated by the WESPs and HEMEs. The contents are recirculated through the SBSs or transferred to the acidic waste vessel (RLD-VSL-00007) in the RLD. Each tank has a maximum capacity of 9,891 gallons.

Each SBS condensate receiver vessel is equipped with the following:

- pressure, level, and temperature instruments, with the temperature elements replaceable through a joggle sleeve.
- cooling water jacket
- RFDs (HOP-RFD-00001A/B and HOP-RFD-00002A/B or HOP-RFD-00003A/B and HOP-RFD-00004A/B)
- RFD ejectors (HOP-EJCTR-00913 through HOP-EJCTR-00916 or HOP-EJCTR-00925 through HOP-EJCTR-00928)
- RFD charge vessels (HOP-VSL-00004A/B and HOP-VSL-00101A/B or HOP-VSL-00905A/B and HOP-VSL-00906A/B)
- PJMs (HOP-PJM-00001 through 00003 and HOP-PJM-00007 or HOP-PJM-00008 through 00011)
- PJM ejectors (HOP-EJCTR-00909 through 00912 or HOP-EJCTR-00921 through 00924)
- vessel-emptying ejectors (HOP-EJCTR-00003A/B or HOP-EJCTR-00929A/B)

The tanks, their internal components, and process piping are made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The cooling jackets on the tank exterior are made of stainless steel 304L (UNS S30403).

5.3.3.1 Design Standards

The SBS condensate receiver vessels are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These tanks have an approximate 12-ft inside diameter and a 7-ft, 9-inch tangent to tangent length. The shell and head thicknesses are 0.6250-inch (shell) and 0.6875-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a

0.004-inch erosion allowance required for this tank. Additional erosive wear plates of at least 0.081-inch thickness of Alloy C-22 (UNS N06022) are provided as localized protection for the applicable portions of the bottom head to accommodate erosive wear due to the PJM discharges. The RFDs, RFD charge vessels, PJMs, and vessel-emptying ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.3.2 Characteristics of the Waste

The SBS condensate receiver vessels receive condensate and wash solutions generated by the SBSs, WESPs, and HEMEs. The blended contents are approximately 99 wt% water and 1 wt% solids with a pH ranging from 1.0 to 8.5 (24590-HLW-M5-V17T-P0003, 24590-WTP-M4C-V11T-00010, 24590-HLW-N1D-HOP-00009).

The materials of the SBS condensate receiver vessels and ancillary equipment are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

5.3.4 Wet Electrostatic Precipitators (HOP-WESP-00001 and HOP-WESP-00002)

The WESPs (HOP-WESP-00001 and HOP-WESP-00002) are miscellaneous units located in hard-to-reach areas H-0308 and H-0302, respectively. The area of each room containing a WESP is equipped with a stainless steel liner and gravity drain sump (HFP-SUMP-00001 or HFP-SUMP-00004). The WESP HOP-WESP-00001 is associated with Melter 1, and WESP HOP-WESP-00002 is associated with Melter 2. Rooms H-0308 and H-0302 have a radiological area classification of R5/C5 (Table 6).

After initial aerosol and soluble gas removal in the SBS, the cooled melter offgas is routed to a WESP for further removal of particulates and aerosols. The WESP houses vertical tubes that act as positive electrodes. Each of these tubes also has a single negatively charged electrode, which runs down the centerline of each tube. A high voltage transformer/rectifier supplies the power to these electrodes. To insure a uniform distribution of the inlet offgas into the electrode tubes, a gas distributor may be used. The strong electric field, generated by the discharge electrode, generates electrons that apply a negative charge to the offgas particles. These negatively charged particles are then attracted to the positively charged tube walls. The collected particles are partially washed from the tube wall by entrained condensate that also collects on the inner tube wall. The solids are periodically washed from the tubes using water sprays located above the tubes. The water and collected particulates drain into the SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904). The WESP electric field and power is controlled by setting the voltage applied between the electrodes.

The WESPs drain directly into HOP-VSL-00903 and HOP-VSL-00904. There are currently no sumps in the WESPs for hold-up and collection of liquid. The WESP drain flow rate is small compared to other streams flowing into HOP-VSL-00903 and HOP-VSL-00904, making a sample of the HOP-VSL-00903 and HOP-VSL-00904 contents non-representative of the WESP effluent.

The WESP housings and process piping are made of 6% molybdenum alloy (UNS N08367) to ensure a 40-year life.

5.3.4.1 Design Standards

The WESP housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. The shell and head thicknesses include the minimum 0.040-inch standard corrosion allowance (with no erosion allowance). Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.4.2 Characteristics of the Waste

The WESPs receive scrubbed melter offgas from the SBSs that is approximately 8.9 wt% water, 90 wt% gases (primarily N_2, O_2, and CO_2), and 1.1 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the WESPs are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.5 High Efficiency Mist Eliminators (HOP-HEME-00001A/B and HOP-HEME-00002A/B)

The HEMEs (HOP-HEME-00001A/B and HOP-HEME-00002A/B) are miscellaneous units located in melter cave rooms H-0117 and H-0106, respectively. The HEMEs HOP-HEME-00001A/B are associated with Melter 1, and HEMEs HOP-HEME-00002A/B are associated with Melter 2. Rooms H-0117 and H-0106 have a radiological area classification of R5/C5 and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The purpose of the HEMEs is to further remove radioactive aerosols from the melter offgas and vessel vent offgas, thereby reducing the solids-loading rates on the downstream HEPA filters. A HEME is a wet filter that has a minimum aerosol removal efficiency of approximately 99% for aerosols less than one micron. A water misting nozzle is installed in the HEME gas inlet. The water mist facilitates manual washings of primarily water soluble solids from the filter elements. As the offgas passes through the HEME, the liquid droplets and other aerosols in the offgas interact and adhere to the filaments by surface tension. The droplets agglomerate, grow, and eventually acquire enough mass to flow by gravity to the bottom of the unit and drain into the SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904). As the condensate flows down through the filter bed, a washing action is generated that helps remove and dissolve accumulated solids from the filter elements.

Solids will accumulate in the bed over time, causing the pressure drop across the filter to increase. When the pressure drop across the HEME reaches a predefined level, it is taken offline and washed with demineralized water to remove the accumulated solids. Insoluble solids may remain, and their accumulation eventually leads to the replacement of the HEME filter elements due to high differential pressures. The filter elements can be changed out remotely. The HEMEs may be filled with nitric acid to allow the filters to soak, thus facilitating solids removal. The spent nitric acid soak solution is eventually drained to the SBS condensate receiver vessels.

Leaks from the HEMEs can flow to sumps HOP-SUMP-00003 and HOP-SUMP-00008 by gravity drains. HOP-SUMP-00003 and HOP-SUMP-00008 are located in rooms H-B021 and H-B005, which are located directly below rooms H-0117 and H-0106, respectively.

The HEMEs and process piping are made of 6% molybdenum alloy (UNS N08367) to ensure a 40-year life.

5.3.5.1 Design Standards

The HEME housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and are code-stamped. These HEME housings have ASME flanged and dished heads with an approximate 5-ft, 6-inch inside diameter and a 12-ft, 2-inch tangent to tangent length. The shell and head thicknesses are 0.5-inch minimum. Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for the HEME housings. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.5.2 Characteristics of the Waste

The HEMEs remove radioactive aerosols that are present in the offgas. The inlet offgas is approximately 8.9 wt% water, 89.9 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEMEs are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.6 HEPA Electric Preheaters (HOP-HTR-00001B, HOP-HTR-00002A, and HOP-HTR-00005A/B)

The HOP HEPA electric preheaters (HOP-HTR-00001B, HOP-HTR-00002A, and HOP-HTR-00005A/B) are miscellaneous units located within the west wall of the hot cell room H-0104 (HLW filter cave). This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The main function of the electric preheaters is to raise the temperature of the saturated offgas from the HEMEs to a higher temperature (above the dew point) to eliminate liquid aerosols and reduce the relative humidity to prevent condensate accumulation that can cause damage to the HEPA filters. The preheaters contain heating elements. Element failure is detected by a loss of current flow through the element with an associated indicator. The failed element is replaced as appropriate. Temperature indicators are also provided in the preheaters to detect abnormally high temperatures. Controls are provided to turn off the heater power when an abnormally high temperature is detected.

The HEPA electric preheater housings and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.3.6.1 Design Standards

The HEPA electric preheaters are of a standard design used for the WTP PJV and HOP systems. The electric preheater housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME AG-1; code stamping is not required. The thickness of the housings includes the minimum 0.040-inch standard corrosion allowance. The heaters are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.6.2 Characteristics of the Waste

The offgas from the HEPA electric preheaters is approximately 9.0 wt% water, 89.8 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA electric preheaters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.7 HEPA Filters (HOP-HEPA-00001A/B, HOP-HEPA-00002A/B, HOP-HEPA-00007A/B, and HOP-HEPA-00008A/B)

The HEPA filters (HOP-HEPA-00001A/B, HOP-HEPA-00002A/B, HOP-HEPA-00007A/B, and HOP-HEPA-00008A/B) are miscellaneous units located in hot cell room H-0104. This room has a radiological area classification of R5/C5 and is designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

The main function of the HEPA filters is to perform high efficiency removal of sub-micron particulates from the heated offgas. Each of the two melters has a module of HEPA filters. Each module is comprised of two filter banks, located back to back, in a housing with a common center wall and secured on a single mounting frame. Melter HMP-MLTR-00001 has filter banks HOP-HEPA-00001A/B and HOP-HEPA-00002A/B, while melter HMP-MLTR-00002 has filter banks HOP-HEPA-00007A/B and HOP-HEPA-00008A/B. Each bank has an entrance plenum with baffles, an inlet plenum above the filter deck with access covers for each filter element, a filter deck with a row of HEPA filters, an outlet plenum below the filter deck, and an exit plenum with access portal and cover. The filters are guided into the module by stainless steel guide rails. Sample injection and removal ports are provided on the housing or piping.

The HEPA housings and process piping are made of stainless steel 304L (UNS S30403) to ensure a 40-year life. The HEPA filters are to be replaced when needed.

5.3.7.1 Design Standards

The HEPA filters are of a standard design used for the WTP PJV, HOP, and HVAC systems. The HEPA filters are a vendor package. The HEPA filters are a radial flow type, meeting the performance requirements of ASME AG-1. The HEPA housings are designed in accordance with ASME AG-1.

5.3.7.2 Characteristics of the Waste

The offgas from the HEPA filters is approximately 8.8 wt% water, 89.9 wt% gases (primarily N_2, O_2, and CO_2), and 1.3 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.8 Catalyst Skid Preheaters (HOP-HX-00001 and HOP-HX-00003) and Electric Heaters (HOP-HTR-00001 and HOP-HTR-00007)

The catalyst skid preheaters (HOP-HX-00001 and HOP-HX-00003) and electric heaters (HOP-HTR-00001 and HOP-HTR-00007) are miscellaneous units located in room H-A123. HOP-HX-00001 and HOP-HTR-00001 are installed on the catalyst skid HOP-SCO-00002, and HOP-HX-00003 and HOP-HTR-00007 are installed on the catalyst skid HOP-SCO-00003. Room H-A123 has a radiological area classification of R3/C2/C3 (Table 6).

Each catalyst skid contains the components to catalytically decompose the VOCs and reduce the NOx in the offgas at an elevated temperature. The skids are designed not to exceed a 25-ft length by 5-ft width by 10-ft height.

The offgas is passed through a catalyst skid preheater and a catalyst skid electric heater before entering the thermal catalytic oxidizers and NOx selective catalytic reducers. The catalyst skid preheaters are plate-type recuperative heat exchangers designed to recover heat from the offgas exhaust of the catalyst skids. The catalyst skid electric heaters heat the offgas to the final temperature for reaction. The electric heaters are element-type mounted on a removable flanged plate for ease of maintenance.

The catalyst skid preheaters (cold side and enclosure), electric heaters, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The hot-side components and heat exchanger tubes for the preheaters are made of stainless steel 347 (UNS S34700).

5.3.8.1 Design Standards

The catalyst skid preheaters and electric heaters are of a standard design used for the WTP PJV and HOP systems. The heaters are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.8.2 Characteristics of the Waste

The offgas from the catalyst skid preheaters and electric heaters is approximately 10.5 wt% water, 88.3 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the catalyst skid preheaters and electric heaters are

considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.9 Thermal Catalytic Oxidizers (HOP-SCO-00001 and HOP-SCO-00004) and NO_x Selective Catalytic Reducers (HOP-SCR-00001 and HOP-SCR-00002)

The thermal catalytic oxidizers (HOP-SCO-00001 and HOP-SCO-00004) and NOx selective catalytic reducers (HOP-SCR-00001 and HOP-SCR-00002) are miscellaneous units located in room H-A123. HOP-SCO-00001 and HOP-SCR-00001 are installed on the catalyst skid HOP-SCO-00002, and HOP-SCO-00004 and HOP-SCR-00002 are installed on the catalyst skid HOP-SCO-00003. Room H-A123 has a radiological area classification of R3/C2/C3 (Table 6).

Each catalyst skid contains the components to catalytically decompose the VOCs and reduce the NOx in the offgas. After the offgas passes through a catalyst skid preheater and catalyst skid electric heater, it enters the thermal catalytic oxidizers and NOx selective catalytic reducers. The thermal catalytic oxidizer is a noble metal-based (likely platinum) honeycomb structure that provides the contact surface to facilitate VOC decomposition. The NOx selective catalytic reducer is a metal oxide (e.g., vanadium) honeycomb structure that provides the contact surface to facilitate the NOx and ammonia (injected in front of the selective catalytic reducer) reaction to decompose the NOx.

The thermal catalytic oxidizer housings, selective catalytic reducer housings, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The catalyst beds are anticipated to have a service life of 2 to 4 years.

5.3.9.1 Design Standards

The thermal catalytic oxidizers and selective catalytic reducers are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII; ASME B31.3-96, Process Piping; and AISC M016-89, Manual of Steel Construction. The housings for the oxidizer and reducers have no required standard corrosion allowances. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.9.2 Characteristics of the Waste

The thermal catalytic oxidizers and selective catalytic reducers remove VOCs and NOx that are present in the offgas. The inlet offgas is approximately 10.5 wt% water, 88.3 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the thermal catalytic oxidizers and selective catalytic reducers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.10 Silver Mordenite Preheaters (HOP-HX-00002 and HOP-HX-00004)

The silver mordenite preheaters (HOP-HX-00002 and HOP-HX-00004) are miscellaneous units located in room H-A123. This room has a radiological area classification of R3/C2/C3 (Table 6).

The silver mordenite preheaters are high temperature, industrial plate heat exchangers and recover heat from the offgas exhaust of catalyst skids HOP-SCO-00002 and HOP-SCO-00003. The preheaters adjust the temperature of the offgas to the desired level before it enters the silver mordenite columns. The preheaters have pressure and temperature instrumentation.

The silver mordenite preheaters and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.3.10.1 Design Standards

The silver mordenite preheaters are of a standard design used for the WTP PJV and HOP systems. The preheater housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The heaters are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.10.2 Characteristics of the Waste

The offgas from the silver mordenite preheaters is approximately 10.6 wt% water, 88.2 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the silver mordenite preheaters are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.11 Silver Mordenite Columns (HOP-ABS-00002 and HOP-ABS-00003)

The silver mordenite columns (HOP-ABS-00002 and HOP-ABS-00003) are miscellaneous units located in room H-B001B. This room has a radiological area classification of R2/C2 (Table 6).

The silver mordenite columns are located downstream of the catalyst skids, after the offgas has passed through the silver mordenite preheaters. These columns remove gaseous halogens such as radioactive iodine-129, fluorine, and chlorine from the offgas. Halide monitors are located downstream of the columns to monitor for breakthrough, which indicates the need for media replacement. When the silver mordenite cartridge loading capacity is exhausted, the cartridge can be replaced similar to a HEPA filter.

The silver mordenite column housings and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The silver mordenite cartridges are to be periodically replaced, approximately every 5 years.

5.3.11.1 Design Standards

The silver mordenite column housings are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME AG-1/1a; code stamping is not required. The housings for the columns have no minimum standard corrosion allowances. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.11.2 Characteristics of the Waste

The silver mordenite columns remove gaseous halogens from the offgas. The inlet offgas is approximately 10.6 wt% water, 88.2 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the silver mordenite columns are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.12 Activated Carbon Adsorbers (HOP-ADBR-00001A/B and HOP-ADBR-00002A/B)

The activated carbon adsorbers (HOP-ADBR-00001A/B and HOP-ADBR-00002A/B) are miscellaneous units located in room H-A123. The two activated carbon adsorbers HOP-ADBR-00001A/B are associated with Melter 1, and activated carbon adsorbers HOP-ADBR-00002A/B are associated with Melter 2. Room H-A123 has a radiological area classification of R3/C2/C3 (Table 6).

The sulfur impregnated activated carbon columns remove volatile mercury compounds from the offgas at a mildly elevated temperature. Each column consists of two activated carbon beds; each bed has a volume of approximately 2 cubic meters. The beds are operated in series during normal operations. When gaseous mercury is detected breaking through the leading bed, the offgas flow is manually changed to make the trailing bed the leading bed, and only one column is used while the exhausted bed is removed and replaced. The flow is then changed to make the fresh bed the trailing bed.

The activated carbon adsorbers and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The minimum design life of the activated carbon media is 1 year at nominal concentrations of mercury with the beds operating in series.

5.3.12.1 Design Standards

The activated carbon adsorbers are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and ASME AG-1. These adsorbers have an approximate 12-ft length, 9-ft width, and 13-ft height. The shell and head thicknesses are 0.375-inch. The adsorbers have no minimum standard corrosion allowances. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.12.2 Characteristics of the Waste

The activated carbon adsorbers remove volatile mercury compounds that are present in the offgas. The inlet offgas is approximately 8.8 wt% water, 90.0 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the activated carbon adsorbers are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.13 Booster Extraction Fans (HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C) and Stack Extraction Fans (HOP-FAN-00008A/B/C and HOP-FAN-00010A/B/C)

The booster extraction fans (HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C) are located in room H-B001C, which has a radiological area classification of R2/C2. The stack extraction fans (HOP-FAN-00008A/B/C and HOP-FAN-00010A/B/C) are located in room H-0429, which has a radiological area classification of R2/C2/C3 (Table 6). These fans are miscellaneous units.

The booster extraction fans are three 50% capacity fans that operate in parallel (two primary fans that provide 100% capacity for normal operations and one standby fan) to partially provide the offgas motive force for the HOP and PVV. The stack extraction fans are also three 50% capacity fans that operate in parallel (two primary fans and one standby fan) to provide the balance of the offgas motive force for the HOP and PVV systems and to discharge the treated offgas to the atmosphere through the HLW vitrification facility's exhaust stack. The fans and their control systems are the same. The extraction fans have variable speed drives.

The booster extraction fans, stack extraction fans, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.3.13.1 Design Standards

The booster extraction fans and stack extraction fans are of a standard design used for the WTP PJV and HOP systems. The fans are fabricated in accordance with the ASME AG-1. The fans are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.3.13.2 Characteristics of the Waste

The offgas from the booster extraction fans is approximately 8.8 wt% water, 90.0 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids. The offgas from the stack extraction fans is approximately 8.2 wt% water, 90.6 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the HOP. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the booster extraction fans and stack extraction fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of

construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.3.14 Secondary Containment (HOP-SUMP-00003 and HOP-SUMP-00008)

The HOP tank systems and miscellaneous unit systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HOP SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904) described above are located in stainless steel-lined rooms H-B005 and H-B021 with sumps HOP-SUMP-00003 and HOP-SUMP-00008 embedded in the floor. Both rooms are black cells, have a radiological area classification of R5/C5, and are designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HOP-SUMP-00003 and HOP-SUMP-00008 are equipped with radar-type level detectors and have ejectors. All sumps are fabricated with 6% molybdenum alloy (UNS N08367).

Leaks from the SBS condensate receiver vessel HOP-VSL-00903 flow into sump HOP-SUMP-00003. This sump also receives waste, through the gravity floor drain, from the secondary containment for the Melter 1 miscellaneous units SBS (HOP-SCB-00001) and HEMEs (HOP-HEME-00001A/B). The SBS and HEMEs are located in the western section of Melter Cave 1 (room H-0117), which is located directly above the SBS drains collection cell 1 (room H-B021). Two ejectors (RLD-EJCTR-0053A/B) transfer the waste from sump HOP-SUMP-00003 to the plant wash and drains vessel (RLD-VSL-00008).

Leaks from HOP-VSL-00904 flow into sump HOP-SUMP-00008. This sump also receives waste, through the gravity floor drain, from the secondary containment for the Melter 2 miscellaneous units SBS (HOP-SCB-00002) and HEMEs (HOP-HEME-00002A/B). The SBS and HEMEs are located in the western section of Melter Cave 2 (room H-0106), which is located directly above the SBS drain collection cell 2 (H-B005). Two ejectors (RLD-EJCTR-00176A/B) transfer the waste to RLD-VSL-00008.

5.3.14.1 Design Standards

Sumps HOP-SUMP-00003 and HOP-SUMP-00008 are dry sumps, with dimensions of 30 inches in diameter by 18 inches deep. All sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

5.3.14.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from the melters' SBS condensate receiver vessels, SBSs, and HEMEs. Previous sections describe the materials managed in these tanks, miscellaneous units, and associated piping. The materials of construction for secondary containment system are compatible with the waste managed in the HOP.

Assessment for sumps located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

5.4 HLW Melter Cave Support Handling System

The function of the HSH is to mechanically handle all remote equipment associated with the melter caves to allow normal melter process operations. Since personnel access is not allowed into the melter caves, tasks are performed remotely through a combination of shield doors and windows, cranes, manipulators, tool transfer ports, and other ancillary mechanical handling equipment.

The DWP-regulated plant items associated with the HSH include the decontamination tanks (HSH-TK-00001 and HSH-TK-00002) for the two melter caves. These tanks are located in rooms H-0310A and H-0304A, respectively, on the 0-ft elevation level.

5.4.1 Decontamination Tank Melter Cave 1 (HSH-TK-00001) and Decontamination Tank Melter Cave 2 (HSH-TK-00002)

The decontamination tanks HSH-TK-00001 and HSH-TK-00002 are located in rooms H-0310A and H-0304A, respectively. The area of each room containing a tank is equipped with a stainless steel liner, sump (HSH-SUMP-00008 or HSH-SUMP-00009), and sump ejector (RLD-EJCTR-00026 or RLD-EJCTR-00173). Both rooms have a radiological area classification of R5/C5 (Table 6).

The decontamination tanks are operated in several modes: soak, spray, heating, sparging, or chemical injection. Soak mode fills the tank with the selected plant wash media. The decontamination factor may be increased when soaking by sparging the tank with compressed air injected through the bottom spray ring. Alternately, the tank contents may be heated by injecting high pressure steam through the bottom spray ring. Spray mode conserves plant wash media and would normally be used for first pass gross decontamination. Decontamination chemicals may be injected from a drum station and pump located outside of the melter cave. Each of the decontamination tanks has a maximum capacity of 3,718 gallons.

Each of the decontamination tanks has a centrifugal pump (HSH-PMP-00001 or HSH-PMP-00002) for the delivery of high pressure wash media to the spray rings and for discharging the contents of the tank.

The decontamination tanks, their internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.4.1.1 Design Standards

The decontamination tanks are fabricated in accordance with API 620. Each tank has a 6-ft diameter and 20-ft height with an open top. Corrosion allowance is the minimum 0.040-inch standard, with no erosion allowance. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.4.1.2 Characteristics of the Waste

The decontamination tanks contain demineralized water, nitric acid, or other suitable decontamination solutions. The pH of the tanks' contents may be near 0 (24590-HLW-N1D-HSH-P0001).

The materials of construction for the decontamination tanks and ancillary equipment are compatible with the waste managed in the HSH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, these tanks are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

5.4.2 Secondary Containment (HSH-SUMP-00003 and HSH-SUMP-00007 through HSH-SUMP-00009)

The HSH tank systems, HMP miscellaneous unit systems, and HOP miscellaneous unit systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HSH tanks described above are located in stainless steel-lined rooms H-0304A and H-0310A with sumps HSH-SUMP-00008 and HSH-SUMP-00009 embedded in the floor. Two sumps (HSH-SUMP-00003 and HSH-SUMP-00007) are located in stainless steel-lined rooms H-0106 and H-0117 containing melters and film coolers. Rooms H-0304A and H-0310A have a radiological area classification of R5/C5. Rooms H-0106 and H-0117 are hot cells, have a radiological area classification of R5/C5, and are designed for remote maintenance, with equipment driven under its own power to a maintenance area or recovered remotely by external means to a maintenance area, during the 40-year life of the facility (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HSH-SUMP-00003 and HSH-SUMP-00007 are equipped with bubbler-type level detectors, while sumps HSH-SUMP-00008 and HSH-SUMP-00009 are equipped with radar-type level detectors. All sumps have ejectors and are fabricated with 6% molybdenum alloy (UNS N08367).

Sump HSH-SUMP-00003 is located in the central section of Melter Cave 1 (room H-0117). Miscellaneous units located in this room include melter HMP-MLTR-00001 and film coolers HOP-FCLR-00001 and HOP-FCLR-00003. An ejector (RLD-EJCTR-00171) transfers the waste to the plant wash and drains vessel (RLD-VSL-00008).

Sump HSH-SUMP-00007 is located in the central section of Melter Cave 2 (room H-0106). Miscellaneous units located in this room include melter HMP-MLTR-00002 and film coolers HOP-FCLR-00002 and HOP-FCLR-00004. An ejector (RLD-EJCTR-00179) transfers the waste to RLD-VSL-00008.

If the capacity of the decontamination tank melter cave 1 (HSH-TK-00001) is exceeded, the excess overflows into sump HSH-SUMP-00008 located in the Melter 1 equipment decontamination pit (room H-0310A). An ejector (RLD-EJCTR-00026) transfers the waste to RLD-VSL-00008.

If the capacity of tank HSH-TK-00002 is exceeded, the excess overflows into sump HSH-SUMP-00009 located in the Melter 2 equipment decontamination pit (room H-0304A). An ejector (RLD-EJCTR-00173) transfers the waste to RLD-VSL-00008.

5.4.2.1 Design Standards

All sumps are dry sumps, with dimensions of 31.5 inches in length by 25.5 inches in width by 16 inches in depth. The sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

5.4.2.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from the HSH tank systems, HMP miscellaneous unit systems, and HOP miscellaneous unit systems. Previous sections describe the materials managed in these tanks, miscellaneous units, and associated piping.

The materials of construction for secondary containment system are compatible with the waste managed in the HSH, HMP, and HOP. Assessment for sumps located in hot cells is limited to remote monitoring with remote maintenance and decontamination planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank or miscellaneous unit that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

5.5 HLW Canister Decontamination Handling System

The HDH decontaminates filled and sealed IHLW canisters using a ceric nitrate bath. The decontamination process effluent is collected, neutralized, and transferred to the RLD for sampling. The HDH is designed to decontaminate two IHLW canisters per day, based on one canister holding approximately 3 MTG and the HLW vitrification facility production rate of 6 MTG/day.

The DWP-regulated plant items associated with the HDH include the rinse tunnel canister rinse vessel (HDH-VSL-00001) located in the canister rinse tunnel (room H-B039B) at the -16-ft, 6-inch elevation level, canister decon vessels (HDH-VSL-00002 and HDH-VSL-00004) located in the canister decontamination/swabbing cave (room H-B035) at the -16-ft elevation level, and waste neutralization vessel (HDH-VSL-00003) located in room H-B035 at the -16-ft elevation level.

5.5.1 Rinse Tunnel Canister Rinse Vessel (HDH-VSL-00001)

The rinse tunnel canister rinse vessel (HDH-VSL-00001) is located in room H-B039B, which is equipped with a stainless steel liner, sump (HDH-SUMP-00001), and sump ejector (RLD-EJCTR-00055). This room has a radiological area classification of R3/R5/C3/C5 (Table 6).

After transferring a filled IHLW canister into vessel HDH-VSL-00001, the canister is washed with low-pressure demineralized water to remove any loose contamination. The tank has a maximum capacity of approximately 3,300 gallons.

The rinse tunnel canister rinse vessel is equipped with piping for the demineralized water, a spray ring assembly that rinses the IHLW canister, a level transmitter and switch, an overflow line to sump HDH-SUMP-00001, and a centrifugal pump (HDH-PMP-00001) that transfers decontamination effluent from the tank to the waste neutralization vessel (HDH-VSL-00003). The batch volume for the tank is 360 gallons. The pump runs during the batch transfers so that water is pumped out as the rinse water is added into the tank. Therefore, the tank is not required to hold the entire batch volume of demineralized water during normal operations.

The rinse tunnel canister rinse vessel, its internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.5.1.1 Design Standards

The rinse tunnel canister rinse vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The corrosion allowance is the minimum 0.040-inch standard allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping. The centrifugal discharge pump is of a standard design.

5.5.1.2 Characteristics of the Waste

The rinse tunnel canister rinse vessel contains demineralized water with negligible solids by volume. The average pH of the contents is 7.

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HDH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the rinse tunnel canister rinse vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

5.5.2 Canister Decon Vessels (HDH-VSL-00002 and HDH-VSL-00004)

The canister decon vessels (HDH-VSL-00002 and HDH-VSL-00004) are located in room H-B035, which is equipped with a stainless steel liner, sump (HDH-SUMP-00003), and sump ejector (RLD-EJCTR-00054). This room has a radiological area classification of R3/R5/C3/C5 (Table 6).
The canister decon vessels are used to hold the filled IHLW canister and ceric nitrate solution during the decontamination process. Each tank has a maximum capacity of 630 gallons.

The canister decon vessels are equipped with piping for demineralized water, hot water, condensate effluent, cooling water supply and return, and process air for sparging. These tanks are also equipped with dual thermocouples with controllers for the heating/cooling coils; level, pressure, and density transmitters; two spray rings for the nitric acid and demineralized water rinses; a nozzle for the decontamination solution; dual steam ejectors (HDH-EJCTR-00003A/B and HDH-EJCTR-00056A/B); and an overflow line to the waste neutralization vessel (HDH-VSL-00003).

The canister decon vessels, their internal components, and process piping are made of titanium (UNS R50400) to ensure a 40-year life.

5.5.2.1 Design Standards

The canister decon vessels are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The tanks have ASME semi-elliptical bottom with an approximate 2-ft, 6-inch inside diameter and a 18-ft, 4-inch tangent to tangent length. The shell and bottom thicknesses are 0.3125-inch (shell) and 0.3125-inch minimum (bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. The canister decon vessels have a separate, hinged lid assembly. The ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.5.2.2 Characteristics of the Waste

The canister decon vessels contain demineralized water, ceric nitrate, and nitric acid with negligible solids by volume. The pH of the contents is approximately 0 to 0.5 (24590-HLW-N1D-HDH-P0003).

The materials of construction for these tanks and ancillary equipment are compatible with the waste originating from the HDH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the canister decon vessels are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tanks.

5.5.3 Waste Neutralization Vessel (HDH-VSL-00003)

The waste neutralization vessel (HDH-VSL-00003) is located in room H-B035, which is equipped with a stainless steel liner, sump (HDH-SUMP-00003), and sump ejector (RLD-EJCTR-00054). This room has a radiological area classification of R3/R5/C3/C5 (Table 6).

The waste neutralization vessel is used for the neutralization of the spent decontamination solution from the canister decontamination vessels (HDH-VSL-00002 and HDH-VSL-00004), steam condensate, and decontamination effluent from the rinse tunnel canister rinse vessel (HDH-VSL-00001) prior to the transfer of the contents to the RLD for sampling. The tank has a maximum capacity of 5,315 gallons.

The waste neutralization vessel is equipped with piping for the spray rings, sodium hydroxide addition, and hydrogen peroxide addition. It also has level, temperature, and pressure transmitters. HDH-VSL-00003 has an overflow line to sump HDH-SUMP-00003 and inlet nozzles from the canister decontamination vessels (HDH-VSL-00002 and HDH-VSL-00004) effluents and overflows, steam condensate from the canister decontamination vessels' heating coils, and effluent from the rinse tunnel canister rinse vessel (HDH-VSL-00001). Three steam ejectors (HDH-EJCTR-00002A/B and HDH-EJCTR-00057) empty the contents of HDH-VSL-00003 to the RLD (dual ejectors to RLD-VSL-00007 and an ejector to RLD-VSL-00008).

The waste neutralization vessel, its internal components, and process piping are made of stainless steel 304L (UNS S30403) to ensure a 40-year life.

5.5.3.1 Design Standards

The waste neutralization vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. The tank has ASME flanged and dished heads with an approximate 7-ft inside diameter and a 17-ft tangent to tangent length. The shell and head thicknesses are 0.625-inch (shell) and 0.625-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.016-inch erosion allowance required for this tank. The three steam ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.5.3.2 Characteristics of the Waste

The waste neutralization vessel contains demineralized water, cerous nitrate, nitric acid, sodium hydroxide, and hydrogen peroxide with negligible solids by volume. The contents are neutralized to a pH of 8 or greater prior to the transfer of the contents to the RLD for sampling (24590-HLW-3YD-HDH-00002).

The materials of construction for this tank and ancillary equipment are compatible with the waste managed in the HDH. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the waste neutralization vessel is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

5.5.4 Secondary Containment (HDH-SUMP-00001 through HDH-SUMP-00003)

The HDH tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The HDH tanks described above are located in stainless steel-lined rooms H-B035 and H-B039B with sumps HDH-SUMP-00001 and HDH-SUMP-00003 embedded in the floor. A third sump (HDH-SUMP-00002) is located in the SPC-lined, canister rinse bogie maintenance room H-B039A that does not contain tanks. Rooms H-B035 and H-B039B have a radiological area classification of R3/R5/C3/C5, and room H-B039A has a radiological area classification of R3/C3 (Table 6).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary. Sumps HDH-SUMP-00001 through HDH-SUMP-00003 are equipped with radar-type level detectors and have either ejectors or pumps. All sumps are fabricated with 6% molybdenum alloy (UNS N08367).

Leaks from the rinse tunnel canister rinse vessel (HDH-VSL-00001) flow into sump HDH-SUMP-00001. This sump is equipped with an ejector (RLD-EJCTR-00055) that transfers the waste to the plant wash and drains vessel (RLD-VSL-00008).

Sump HDH-SUMP-00002 is located in room H-B039A. Leaks in this room flow into this sump. A pump located at the sump (RLD-PMP-00023) transfers the waste to RLD-VSL-00008.

Leaks from the canister decon vessels (HDH-VSL-00002 and HDH-VSL-00004) and waste neutralization vessel (HDH-VSL-00003) flow into sump HDH-SUMP-00003. If the capacity of HDH-VSL-00003 is

exceeded, the excess overflows into sump HDH-SUMP-00003, which is located in the same room. This sump is equipped with an ejector (RLD-EJCTR-00054) that transfers the waste to RLD-VSL-00008.

5.5.4.1 Design Standards

Sumps HDH-SUMP-00001 through HDH-SUMP-00003 are dry sumps, with dimensions of 30 inches in diameter by 18 inches deep. All sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

5.5.4.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined or SPC-lined rooms, provide secondary containment for wastes from HDH-VSL-00001 through HDH-VSL-00004. Previous sections describe the materials managed in these tanks and associated piping.

The materials of construction for secondary containment system are compatible with the waste managed in the HDH. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

5.6 Pulse Jet Ventilation System

The PJV primarily contains and treats gaseous emissions from HLW fluidics equipment and siphon air ejectors to ensure that regulatory standards and safety requirements are met before the gaseous emissions are discharged to the environment. Fluidics equipment and siphon air ejectors generate emissions that must be contained and treated before being discharged. Potentially contaminated liquid that has formed within the PJV piping is directed to RLD-VSL-00002 for recycle to the PTF.

The DWP-regulated plant items associated with the PJV are the electric heater (PJV-HTR-00002), HEPA filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B), and pulse jet fans (PJV-FAN-00002A/B). These plant items are miscellaneous units. The HEPA filters and electric heater are located in room H-0104 on the 0-ft elevation and 14-ft elevation levels, respectively. The pulse jet fans are located in room H-0424 on the 58-ft elevation level.

5.6.1 Electric Heater (PJV-HTR-00002)

The PJV HEPA electric heater is a miscellaneous unit located within the west wall of the hot cell room H-0104 (HLW filter cave). This room has a radiological area classification of R5/C5 (Table 6).

The main function of the electric heater is to raise the temperature of the offgas to a higher temperature to eliminate liquid aerosols and reduce the relative humidity to prevent condensate accumulation that can cause damage to the HEPA filters. The heater is likely to be exposed to radioactive contamination

because of its position upstream of the HEPA filters. Therefore, the heater is designed to minimize and facilitate maintenance. The heater is also designed to minimize the possible retention of particulates. The heating elements are sheathed with heat conductive tubes to avoid exposure to the untreated emissions from fluidics equipment and siphon air ejectors.

The HEPA electric heater is made of stainless steel 316L (UNS S31603) with the plenum chamber made of stainless steel 304L (UNS S30403) to ensure a 40-year life.

5.6.1.1 Design Standards

The HEPA electric heater is of a standard design used for the WTP PJV and HOP systems. The electric heater housing is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1; code stamping is not required. The thickness of the housing includes the minimum 0.040-inch standard corrosion allowance with no erosion allowance. The heater is a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.6.1.2 Characteristics of the Waste

The offgas from the HEPA electric heater is approximately 1.2 wt% water, 97.6 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for this miscellaneous unit are compatible with the waste managed in the PJV. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the heater is considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in this miscellaneous unit.

5.6.2 HEPA Filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B)

The HEPA filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B) are miscellaneous units located in room H-0104. This room has a radiological area classification of R5/C5 (Table 6).
The main function of the HEPA filters is to remove radioactive particulates from the offgas before discharging to the atmosphere through the HLW vitrification facility stack. There are four PJV filter banks with five HEPA filters per bank. Emissions flow through a bank's HEPA filters at the same time in parallel. Two HEPA filter banks are used in series to meet ALARA guidelines and to provide redundant protection in case the first bank of HEPA filters fails. In addition, two standby and redundant banks of HEPA filters are installed in parallel to the two operating banks to enable continuous operation of the PJV. The standby HEPA filters banks also allow operation of the system when the filters in the active banks need to be replaced.

The HEPA housings are made of stainless steel 304L (UNS S30403) to ensure a 40-year life. The HEPA filters are to be replaced when needed.

5.6.2.1 Design Standards

The HEPA filters are of a standard design used for the WTP PJV, HOP, and HVAC systems. The HEPA filters are a vendor package. The HEPA filter inserts are a radial flow type, meeting the performance requirements of ASME AG-1. The HEPA housings are designed in accordance with ASME AG-1.

5.6.2.2 Characteristics of the Waste

The offgas from the HEPA filters is approximately 1.2 wt% water, 97.6 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the HEPA filter units are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.6.3 Pulse Jet Fans (PJV-FAN-00002A/B)

The pulse jet fans are miscellaneous units located in room H-0424. This room has a radiological area classification of R2/C2/C3 (Table 6). The PJV requires extraction fans to remove emissions from fluidics equipment and siphon air ejectors, to draw emissions through the HEPA filters, to maintain a vacuum in the PJV, and to discharge treated emissions to the atmosphere through the HLW vitrification facility exhaust stack. The fans are designed to move the maximum quantity of fluidics equipment and siphon air ejector emissions through the system while maintaining a vacuum in the system. Exhaust fans are equipped with adjustable speed drives to allow adjustment of the fan speed to respond to variations in flow rates of emissions. A backup extraction fan is installed in parallel to the operating fan to allow continuous operation of the PJV in case the primary fan fails or requires maintenance.

The pulse jet fans are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.6.3.1 Design Standards

The pulse jet fans are of a standard design used for the WTP PJV and HOP systems. The fans are fabricated in accordance with the ASME AG-1. The fans are a vendor package. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.6.3.2 Characteristics of the Waste

The offgas from the pulse jet fans is approximately 1.2 wt% water, 97.6 wt% gases (primarily N_2, O_2, and CO_2), and 1.2 wt% solids.

The materials of construction for these miscellaneous units are compatible with the waste managed in the PJV. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, the pulse jet fans are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in these miscellaneous units.

5.7 Radioactive Liquid Disposal System

The RLD receives radioactive effluents from the HOP and HDH tanks, out-of-specification process streams, and periodic plant and tank washes within the HLW vitrification facility. The purpose of the RLD is to handle liquid waste for interim storage before transferring the effluents to the PTF where the

waste is recycled to the process. Various operations such as neutralization, mixing, and sampling of the waste are performed in the RLD.

The DWP-regulated plant items associated with the RLD include the offgas drains collection vessel (RLD-VSL-00002), acidic waste vessel (RLD-VSL-00007), and plant wash and drains vessel (RLD-VSL-00008). These tanks are located in room H-B014 at the -21-ft elevation level.

5.7.1 Offgas Drains Collection Vessel (RLD-VSL-00002)

The offgas drains collection vessel (RLD-VSL-00002) is located in black cell room H-B014, which is equipped with a stainless steel liner, a sump (RLD-SUMP-00001), and two sump ejectors (RLD-EJCTR-00052A/B). This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The offgas drains collection vessel receives little or no transfer of effluent during normal operations. It can receive condensate from the low points in the main offgas ducts downstream of the HEMEs (HOP-HEME-00001A/2A and HOP-HEME-00001B/2B), condensate from the low points in the main PJV header, and plant wash. Since the contents of RLD-VSL-00002 are mostly water and have very low solids, the contents do not require mixing. The tank contents are transferred to the plant wash and drains vessel (RLD-VSL-00008). The contents of RLD-VSL-00002 are sampled along with the rest of the contents of RLD-VSL-00008 before being transferred to the PTF.

The offgas drains collection vessel is equipped with pressure, level, and temperature instruments, and vessel-emptying ejectors (RLD-EJCTR-00020A/B).

The offgas drains collection vessel, its internal components, and process piping are made of stainless steel 316L (UNS S31603) to ensure a 40-year life.

5.7.1.1 Design Standards

The offgas drains collection vessel is fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. It has ASME flanged and dished heads with an approximate 3-ft, 6-inch inside diameter and a 4-ft tangent to tangent length. The shell and head thicknesses are 0.375-inch (shell) and 0.250-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.7.1.2 Characteristics of the Waste

The offgas drains collection vessel receives plant wash and condensate from the low points in the main offgas ducts downstream of the HEMEs and main PJV header. The blended contents are mostly water with negligible solids by volume (approximately 0.07 wt% solids). The contents have a pH ranging from less than 2.5 to 6.5 (24590-HLW-N1D-RLD-00013).

The materials of the offgas drains collection vessel and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a lower

potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

5.7.2 Acidic Waste Vessel (RLD-VSL-00007) and Breakpots (RLD-BRKPT-00007 and RLD-BRKPT-00009)

The acidic waste vessel (RLD-VSL-00007) is located in the black cell room H-B014, which is equipped with a stainless steel liner, a sump (HCP-SUMP-00001), and two sump ejectors (RLD-EJCTR-00049A/B). This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The acidic waste vessel receives liquid from the SBSs (HOP-SCB-00001 and HOP-SCB-00002), SBS condensate receiver vessels (HOP-VSL-00903 and HOP-VSL-00904), and waste neutralization vessel (HDH-VSL-00003). The collected waste consists of SBS purge, WESP and HEME drainage, and neutralized canister decontamination waste. The PJMs mix the tank contents in order to collect a representative sample. Sodium hydroxide is added to the tank based on the sample analysis and the volume of effluent in the tank. The tank contents are sampled to measure the final pH before each transfer to PWD-VSL-00043. The acidic waste vessel has a maximum capacity of 18,145 gallons.

The acidic waste vessel is equipped with the following:

- pressure, level, and temperature instruments
- RFDs (RLD-RFD-00162A/B)
- RFD ejectors (RLD-EJCTR-00004 and RLD-EJCTR-00057)
- RFD charge vessels (RLD-VSL-00015A/B)
- PJMs (RLD-PJM-00005 through 00008)
- PJM ejectors (RLD-EJCTR-00001 through 00003 and RLD-EJCTR-00016)
- transfer breakpots (RLD-BRKPT-00007 and RLD-BRKPT-00009), each with a total volume of 82 gallons
- vessel-emptying ejectors (RLD-EJCTR-00008, RLD-EJCTR-00050, RLD-EJCTR-00056, and RLD-EJCTR-00059)

The acidic waste vessel is made of 6% molybdenum alloy (UNS N08367 or N08926) to ensure a 40-year life. The head on the inside of the tank under several nozzles has a band of Hastelloy C-276 clad layer for additional protection. Process piping is made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The transfer breakpots are made of stainless steel 316L (UNS S31603).

5.7.2.1 Design Standards

The acidic waste vessel and transfer breakpots are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. Vessel RLD-VSL-00007 has ASME flanged and dished heads with an approximate 13-ft inside diameter and a 15-ft, 6-inch tangent to tangent length. The shell and head thicknesses are 0.748-inch (shell) and 0.748-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.004-inch erosion allowance required for this tank. An additional erosive wear allowance of at least a 0.027-inch thickness of 6% molybdenum is provided as localized protection for the applicable portions of the bottom head to accommodate erosive wear due to

the PJM discharges. The RFDs, RFD charge vessels, PJMs, and ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.7.2.2 Characteristics of the Waste

The acidic waste vessel receives waste that consists of SBS purge, WESP and HEME drainage, and neutralized canister decontamination waste. The blended contents are approximately 98.8 wt% water and 1.2 wt% solids. The contents are neutralized to a pH of 8 or greater before transferring to PWD-VSL-00043 (24590-HLW-N1D-RLD-00001, 24590-HLW-3YD-RLD-00001).

The materials of construction for the acidic waste vessel and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

5.7.3 Plant Wash and Drains Vessel (RLD-VSL-00008) and Breakpot (RLD-BRKPT-00004)

The plant wash and drains vessel (RLD-VSL-00008) is located in the southern section of black cell room H-B014, which is equipped with a stainless steel liner, a sump (HCP-SUMP-00001), and two sump ejectors (RLD-EJCTR-00049A/B). This room has a radiological area classification of R5/C5 and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

The plant wash and drains vessel receives tank, sump, and plant washes from C3 and C5 areas within the HLW vitrification facility. The tank also collects wash water from cell walls, equipment exterior surfaces, stainless steel cladding, and racks. The PJMs mix the tank contents in order to collect a representative sample. Sodium hydroxide is added to the tank based on the sample analysis and the volume of effluent in the tank. The tank receives intermittent flows; its contents are transferred to PWD-VSL-00043. The tank contents are sampled to measure the final pH before each transfer to the PTF tank. RLD-VSL-00008 has a maximum capacity of 13,774 gallons.

The plant wash and drains vessel is equipped with the following:

- pressure, level, and temperature instruments
- RFDs (RLD-RFD-00163A/B)
- RFD ejectors (RLD-EJCTR-00006 and RLD-EJCTR-00058)
- RFD charge vessels (RLD-VSL-00016A/B)
- PJMs (RLD-PJM-00001 through 00004)
- PJM ejectors (RLD-EJCTR-00009 through 00011 and RLD-EJCTR-00017)
- transfer breakpot (RLD-BRKPT-00004) with a total volume of 82 gallons.
- vessel-emptying ejectors (RLD-EJCTR-00007, RLD-EJCTR-00038, and RLD-EJCTR-00018A/B).

The plant wash and drains vessel is made of stainless steel 316L (UNS S31603) to ensure a 40-year life. The inside of the tank's head, at several nozzle locations, has a band of Hastelloy C-276 clad layer for

additional protection. Process piping is made of Alloy C-22 (UNS N06022) to ensure a 40-year life. The transfer breakpot is made of stainless steel 304L (UNS S30403).

5.7.3.1 Design Standards

The plant wash and drains vessel and transfer breakpot are fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and is code-stamped. RLD-VSL-00008 has an approximate inside 13-ft diameter and a 9-ft, 9-inch tangent to tangent length. The shell and head thicknesses are 0.748-inch (shell) and 0.748-inch minimum (top and bottom). Thicknesses include the minimum 0.040-inch standard corrosion allowance, which is adequate for the 0.024-inch corrosion allowance plus a 0.016-inch erosion allowance required for this tank. An additional erosive wear allowance of at least a 0.014-inch thickness of stainless steel 316L (UNS S31603) is provided as localized protection for the applicable portions of the bottom head to accommodate erosive wear due to the PJM discharges. The RFDs, RFD charge vessels, PJMs, and ejectors are of a standard design. Process piping is designed in accordance with ASME B31.3-96, Process Piping.

5.7.3.2 Characteristics of the Waste

The plant wash and drains vessel receives various tank, sump, and plant washes. The blended contents are approximately 99.97 wt% water and 0.03 wt% solids. The contents are neutralized to a pH of 8 or greater before transferring to PWD-VSL-00043 (24590-HLW-N1D-RLD-00006, 24590-HLW-3YD-RLD-00001).

The materials of the plant wash and drains vessel and ancillary equipment are compatible with the waste managed in the RLD. The schedule for conducting periodic assessments of this system is provided in Table 7. For the purpose of scheduling periodic assessments, this tank is considered to have a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed in the tank.

5.7.4 Secondary Containment (RLD-SUMP-00001, HCP-SUMP-00001, HPH-SUMP-00001, HPH-SUMP-00003, and HPH-SUMP-00005)

The RLD tank systems are designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640. The RLD tanks described above are located in stainless steel-lined room H-B014 with sumps RLD-SUMP-00001 and HCP-SUMP-00001 embedded in the floor. This room is a black cell, has a radiological area classification of R5/C5, and is designed for no equipment maintenance or entry during the 40-year life of the facility (Table 6).

In addition to sumps RLD-SUMP-00001 and HCP-SUMP-00001, there are two sumps (HPH-SUMP-00001 and HPH-SUMP-00005) located in a stainless steel-lined room (H-0136, canister handling cave) and a sump (HPH-SUMP-00003) located in a stainless steel-lined room (H-B032, pour tunnel 1) that do not contain tanks or miscellaneous units. These rooms have a radiological area classification of R5/C5 (Table 6). Wastes in these sumps are transferred to the RLD plant wash and drains vessel (RLD-VSL-00008).

As required by WAC 173-303-640(4)(e), the height of the stainless-steel liners that form the secondary containment systems are designed to contain 100% of the capacity of the largest tank within its boundary.

All sumps are equipped with radar-type level detectors and have ejectors. All sumps are also fabricated with 6% molybdenum alloy (UNS N08367).

If the capacity of the offgas drains collection vessel (RLD-VSL-00002) is exceeded or failure of the tank occurs, the waste flows to sump RLD-SUMP-00001, which is located in the same section of the room. Two ejectors (RLD-EJCTR-00052A/B) are provided to transfer the waste from the sump to RLD-VSL-00008.

If the capacity of the acidic waste vessel (RLD-VSL-00007) is exceeded, the excess overflows to RLD-VSL-00008. This sump is equipped with two ejectors (RLD-EJCTR-00049A/B). During normal operations, one of the ejectors transfers the waste to RLD-VSL-00008. If the capacity of RLD-VSL-00008 is exceeded, the excess flows into sump HCP-SUMP-00001. The second ejector transfers the waste to breakpot RLD-BRKPT-00004. From this breakpot, the waste flows by gravity to the PTF. Leaks from these two tanks flow into sump HCP-SUMP-00001.

Sumps HPH-SUMP-00001 and HPH-SUMP-00005 collect any liquids or decontamination solutions in the canister handling cave. An ejector (RLD-EJCTR-00051) transfers the wastes from HPH-SUMP-00001 to RLD-VSL-00008. The contents of sump HPH-SUMP-00005 are transferred by an ejector (RLD-EJCTR-00029) to RLD-VSL-00008.

Sump HPH-SUMP-00003 collects any leaks in the pour tunnel 1. An ejector (RLD-EJCTR-00014) transfers the wastes to RLD-VSL-00008.

5.7.4.1 Design Standards

All sumps are dry sumps, with dimensions of 30 inches in diameter by 18 inches deep. The sumps are fabricated in accordance with design methodology specified in ANSI/AISC N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities, and AISC M016-89, Manual of Steel Construction. The sumps are also designed to meet applicable secondary containment, leak detection, integrity, and other criteria defined in WAC 173-303-640.

5.7.4.2 Characteristics of the Waste

During normal operations, the sumps are dry. The sumps, in combination with the stainless steel-lined rooms, provide secondary containment for wastes from the RLD tanks, canister handling cave, and pour tunnel 1.

The materials of construction for secondary containment system are compatible with the waste managed in the RLD, canister handling cave, and pour tunnel 1. Assessment for sumps located in black cells is limited to remote monitoring with no maintenance or entry planned for the 40-year life of the facility. The schedule for conducting periodic assessments of the secondary containment system is provided in Table 7. For the purpose of scheduling periodic assessments, the secondary containment system in each room is considered to have the same potential for corrosion and erosion as the tank that it serves. If DWP-regulated items with different potentials for corrosion and erosion are located in the same room with secondary containment, the secondary containment system is assessed on the same schedule as the regulated item with the higher potential for corrosion and erosion.

6 Underground Transfer Lines

This section provides descriptions of the underground transfer lines, including secondary containment, that are used to transfer wastes from the DOE Tank Farms to the WTP PTF and between the WTP facilities. Information is provided on the purpose of these underground transfer lines, and their design characteristics, including materials of construction and corrosion/erosion allowances. The design standards used for the transfer lines are also provided.

There are 21 underground transfer lines carrying dangerous waste that are connected to, or are within, the WTP facilities. The transfer lines are sloped, with eight of the transfer lines having a minimum slope of 1:50 and the remaining 13 lines having a minimum slope of 1:200. All lines, except the lines from the PTF to the LERF/ETF, are sloped toward the PTF, where the outer jacket pipe terminates in leak detection boxes located within the PTF pipe tunnels. The PTF to LERF/ETF lines are sloped toward the LERF/ETF facility, and the leak detection boxes are located at the WTP boundary.

All underground transfer lines are double-walled, with a 3-inch-diameter nominal stainless steel primary pipe and a 6-inch-diameter nominal carbon steel secondary pipe. The secondary encasement pipe has a fusion bounded epoxy coating with shrink wrap sleeves covering the clamshell welds and a cathodic protection system using an impressed current system. The epoxy coating provides corrosion protection and reduces the current requirement of the cathodic protection system.

Several secondary containment pipes are surrounded by a layer of insulation (1 to 2 inches thick) and a protective polymer outer shell (e.g., secondary pipe from the DOE Tank Farm to the WTP PTF). Because of its isolation from the surrounding soil and groundwater intrusion, the secondary pipe does not need to be cathodically protected; however, it is connected to cathodically protected piping at both ends and therefore may receive some cathodic protection within those areas.

Primary transfer lines are flushed after each use to minimize the accumulation of waste material and prevent corrosion of the line. Flushing capabilities for removing leaks or accumulated liquid from the secondary containment pipe are also provided.

The leak detection system of the underground transfer pipes employs leak detection boxes at the low points of the pipes so that in the event that the primary pipe leaks, the leak is contained by the secondary pipe and drains into the leak detection boxes. In each of the leak detection boxes, there is a level switch to detect leaks. Once the sensing element of the switch detects a leak, the switch sends a signal to activate a leak detection alarm.

For leak detection boxes installed inside the PTF (PWD-LDB-00001 through PWD-LDB-00019), the box is a horizontal stainless steel pipe with capped ends, drain, overflow drain, and weir. The drain located between the weir and the closest end cap (which is called the containment side of the weir), is normally closed by a plug attached to a rod extending to an accessible area above the leak detection boxes. The overflow drain, located in the non-containment side of the weir, has a similar apparatus, but remains open. The level switch is located in the containment side of the weir. The design of the leak detection boxes is provided in 24590-WTP-PER-J-02-002 (*Low-Point Leak Detection in Secondary Containment Systems Including Buried Co-Axial Transfer Lines*) and 24590-BOF-CS-80-00102 (*RAD Transfer Lines, Miscellaneous Details*, Sheet 3).

The leak detection boxes located at the WTP boundary (RLD-LDB-00012 and RLD-LDB-00013) have a similar design as the leak detection boxes installed inside a building. However, the overflow drain remains closed and is opened only after the placement of an appropriate overflow containment receptacle.

Prior to installation in the leak detection boxes, the leak detection level switches are tested for functionality. The leak detection system is periodically self-tested in-situ, to facilitate continuous operability. The design of the underground transfer lines provides quick connections to allow pneumatic tests of the leak detection boxes and secondary containment pipes of the transfer lines.

The underground transfer lines are covered with bedding and backfill materials consisting of granular material or controlled density fill as specified in 24590-BOF-3PS-CE01-T0001, *Engineering Specification for Excavation and Backfill.* The bedding material at the building interfaces consists of an expansion absorbing cushion made of mineral inorganic glass fiber material and a dry, free-flowing granular product formulated from select inert, inorganic materials as specified in 24590-BOF-3PS-C000-T0002, *Engineering Specification for Excavation and Backfill of Underground Radioactive Waste Transfer Lines.*

6.1 Design Standards

The primary containment pipe for the underground transfer lines between the WTP facilities is stainless steel 316L (UNS S31603). The secondary containment pipe is made of carbon steel. It has an epoxy-coating and cathodic protection system to be corrosion resistant during its 40-year design life. The pipes are designed in accordance with ASME B31.3-96, Process Piping.

The 3-inch-diameter nominal primary pipe has a 0.216-inch wall thickness. The 6-inch-diameter nominal secondary pipe has a 0.280-inch wall thickness. The primary pipe from the DOE Tank Farm to the PTF has 0.0160-inch corrosion and erosion allowances. The primary pipes between the WTP facilities have from 0.0425-inch to 0.0937-inch corrosion and erosion allowances. There are no corrosion and erosion allowances specified for the secondary pipe because of the epoxy-coating, the cathodic protection system, and for some of the lines, the insulation and protective polymer outer shell around the pipe.

The likelihood of corrosion of the secondary containment pipe of the transfer lines due to liquid in the annular space is small because any leak from the primary pipe is quickly contained and directed to the leak detection boxes, reducing exposure time. In addition, corrosion of the secondary containment pipe is not expected to occur due to the epoxy coating and cathodic protection system. The use of the tertiary barrier (insulation and protective polymer outer shell) for some of the pipes also isolates the secondary containment pipe from external sources of moisture, which eliminates the occurrence of corrosion.

6.2 Characteristics of the Waste

The PTF receives LAW and HLW waste feeds from the DOE Tank Farms through three transfer lines. The LAW waste feed is approximately 63.7 wt% water, 35.5 wt% dissolved solids, and 0.78 wt% solids with a pH of 14. The HLW waste feed is approximately 70.9 wt% water, 16.5 wt% dissolved solids, and 12.7 wt% solids with a pH of 13 (24590-WTP-M4C-V11T-00010).

The PTF pretreats the feeds and transfers them to the LAW vitrification facility through three transfer lines or to the HLW vitrification facility through four transfer lines. The treated LAW feed is approximately 57.9 wt% water, 42.1 wt% dissolved solids, and 0 wt% solids with a pH of approximately

12.0 to 14 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-TLP-P0005). The treated HLW feed is approximately 76.1 wt% water, 5.6 wt% dissolved solids, and 18.3 wt% solids with a pH of 13.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-HLP-P0007).

Secondary waste from the analytical laboratory is transferred to the PTF for treatment and disposal through one transfer line. Waste includes contents of the hot cell drain collection vessel (RLD-VSL-00165) that are discharged to the PTF plant wash vessel PWD-VSL-00044. The contents of RLD-VSL-00165 are 92.33% water by volume, 6.94% chemical source by volume, 0.73% sample source by volume, and negligible solids by volume (24590-LAB-MVC-RLD-00003).

Secondary waste from the LAW vitrification facility is returned to the PTF for treatment and disposal through four transfer lines. Waste includes contents of the LAW caustic collection tank (LVP-TK-00001), plant wash vessel (RLD-VSL-00003), and SBS condensate collection vessel (RLD-VSL-00005). Tank LVP-TK-00001 receives scrub solution from the caustic scrubber and recirculates the solution back to the caustic scrubber or, periodically, discharges scrubber bottoms that are approximately 90.1 wt% water and 9.8 wt% dissolved solids with a pH of 9.0 to 9.5 to the PTF (24590-WTP-M4C-V11T-00010, 24590-QL-POA-MKAS-00003-08-00003). RLD-VSL-00003 is normally empty, but can receive plant wash that may be corrosive (24590-WTP-M4C-V11T-00010). RLD-VSL-00005 receives recirculation from the SBS condensate collection vertical pumps or transfers from the plant wash vertical pumps. SBS condensate has a pH of 1 to 7.83 (24590-LAW-N1D-RLD-00002).

Secondary waste from the HLW vitrification facility is returned to the PTF through four transfer lines. Waste includes contents of the acidic waste vessel (RLD-VSL-00007) and plant wash and drains vessel (RLD-VSL-00008) described in Sections 5.7.2.2 and 5.7.3.2.

Secondary waste generated within the PTF is transferred through two transfer lines to the LERF/ETF. Waste includes contents of the alkaline effluent vessels (RLD-VSL-00017A/B) and process condensate tanks (RLD-TK-00006A/B). These tanks receive condensate/effluent that is 100 wt% water and has a pH ranging from approximately 11.0 to 14.0 (24590-WTP-M4C-V11T-00010, 24590-PTF-N1D-RLD-00001, 24590-PTF-N1D-RLD-P0002).

The materials of construction for the underground transfer lines are compatible with the waste carried by the lines provided that they are flushed as required (24590-PTF-PER-M-02-003). The transfer lines are considered to have a lower potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, corrosion prevention methods such as epoxy coating and cathodic protection system, and nature of the waste managed in the tank. The underground transfer lines are not accessible for inspection without excavation.

7 Assessment Approach and Schedule

This section presents the integrity assessment approach and schedule for the DWP-regulated plant items in the PTF, HLW vitrification facility, and for underground transfer lines.

7.1 Assessment Approach

This section presents information on the integrity assessments to assure DWP-regulated plant items retain their structural integrity. These activities include routine inspections, operating history reviews, static liquid volume tests, NDEs, and visual inspections.

7.1.1 Routine Inspections

Routine inspections (such as visual inspections, camera inspections, and instrumentation inspections) to check for leaks from tanks, miscellaneous units, breakpots, bulges, sumps, and piping are performed and recorded where design features are provided for that purpose to ensure waste has not leaked from a tank, miscellaneous unit, breakpot, bulge, sump, or pipe. Routine inspections are a part of normal plant operations and contribute to an understanding of the current operating conditions. Routine inspections are performed in accordance with the requirements of Chapter 6.0 of the WTP DWP as specified in WTP DWP condition III.10.C.5.c, WAC 173-303-640(6) and WAC 173-303-680(3). For equipment in accessible areas, routine inspections include visual inspections and/or instrumentation inspections. For equipment in hard-to-reach areas or black cells where visual inspections are not possible, monitoring via instrumentation inspections is used to perform the routine inspections. The data from these routine inspections is considered in scheduling periodic integrity assessments.

7.1.2 Integrity Assessments

Periodic integrity assessments are performed over the life of the DWP-regulated plant items to assure they retain their structural integrity and will not collapse, rupture, or fail. All regulated plant items are categorized into different classes. The classification system allows extra assessment efforts to be focused on regulated plant items that may have the highest potential consequences if failure or loss of containment should occur.

Tanks, miscellaneous units, breakpots, bulges, sumps, and piping with a design life of 40 years are adequately designed and fabricated to last for 40 years without in-service replacement in accordance with the controls and materials of construction described in Section 2 and the design standards described in Sections 4 through 6. For the purpose of scheduling periodic assessments, a DWP-regulated plant item is considered to have a lower potential for corrosion and erosion or a higher potential for corrosion and erosion on the basis of the materials of construction, corrosion and erosion allowances, and nature of the waste managed.

Most equipment is considered to have a lower potential for corrosion and erosion for assessment scheduling. Tanks in which erosion due to higher velocities may occur are considered to have a higher potential for corrosion and erosion. Specifically, tanks with mixers that result in higher velocities are considered to have a higher potential for corrosion and erosion for assessment purposes, even though they are designed with additional thickness to compensate for additional erosion.

The following provides the frequency of assessments for regulated plant items located in accessible areas or hot cells.

- **Frequency of Assessments for Equipment with Lower Potential for Corrosion and Erosion.** Assessment of equipment with lower potential for corrosion and erosion within accessible areas or hot cells is made during routine or maintenance outages and within 10 years after start of hot

commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between integrity assessments. Ten years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required.

- **Frequency of Assessment for Equipment with Higher Potential for Corrosion and Erosion.** Assessment of equipment with higher potential for corrosion and erosion within accessible areas or hot cells is made during routine or maintenance outages and within 7 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between integrity assessments. Because of the potential for increased corrosion and erosion, 7 years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required.

Baseline NDE measurements as described in Section 2.3 are conducted to establish the baseline condition of equipment prior to start of dangerous waste operations. Vendor-provided weld and NDE inspection records and associated quality control documents may also be used to supplement the baseline NDE measurements to establish the baseline condition of equipment prior to start-up and operations. Results of future integrity assessments will be compared to the baseline condition to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted.

Where corrosion and/or erosion rates can be determined, the maximum assessment interval is the smaller of:

> Remaining Corrosion Allowance/2N years (where remaining corrosion allowance is the difference between the measured shell thickness and the minimum required thickness in mils, and N is the corrosion rate in mils per year);

or:

> Seven and 10 years, respectively, for equipment with higher or lower potential for corrosion and erosion.

With no access into the black cells during the 40-year life of the WTP, direct visual or physical inspections of equipment are not possible. Since hard-to-reach areas are designed for no equipment access and maintenance, direct visual or physical inspections of equipment located in these areas are also not possible. For these regulated plant items, instead of performing physical inspections as described above, operating history reviews and static liquid volume leak tests as specified in Sections 7.1.3 and 7.1.4 are conducted. In addition, surrogate equipment for NDE measurements has been selected for these inaccessible plant items as described in Section 7.1.5.

The underground transfer lines are not accessible for direct visual or physical inspections without excavation. For these lines, instead of performing inspections as described above, operating history reviews and pneumatic leak tests as specified in Sections 7.1.3 and 7.1.6 are conducted.

7.1.3 Operating History Reviews

The operating and maintenance history of tanks, miscellaneous units, bulges, sumps, and piping are evaluated to verify that the regulated plant items have been operating within the process envelope used to determine the material of construction and corrosion and erosion allowances. This assessment will include reviewing the process chemistry and parameters such as pH, temperature, and pressure, where available, over the period of assessment. Table 8 provides a summary of the process chemistry and parameters that are generally monitored and evaluated during the operating history reviews. A description of the detailed process chemistry sampling and analysis conducted on dangerous waste managed in the PTF and HLW vitrification facility is provided in 24590-WTP-RPT-ENV-01-003, *Waste Treatment Plant Waste Analysis Plan*. For cases where the process conditions deviate from the design conditions, the data are evaluated to determine potential effects on the regulated plant item corrosion and erosion allowances.

These reviews of operating and maintenance conditions and process chemistry for tanks, miscellaneous units, breakpots, bulges, sumps, and piping are done at least every 2 years, or whenever operating parameters are known to have been outside of the specified process and operating limitations, or when the process chemistry data identified on the respective Corrosion Evaluation Reports/Material Selection Data Sheets, which were used for initial material selection, are revised to incorporate new process information.

Process monitoring is facilitated by a facility-wide autosampling system. The WTP Autosampling System consists of the following major components:

- Ten Autosampler Units - Five located in the PTF, three located in the HLW vitrification facility and two located in the LAW vitrification facility.
- Each sampler is connected to several components that require sampling of their contents. At each autosampler unit, sample bottles are received from a sample container magazine, filled with a sample from the waste stream, and dispatched to the analytical laboratory.
- Pneumatic Transfer System - A network of transport tubes, diverters, exhausters, HEPA filters, and controlled arrival facilities work concurrently to transfer the sample bottles to the analytical laboratory.
- Hot Cell Receipt Station - This is the analytical laboratory receipt station for HLW vitrification facility and PTF samples.

Each autosampling unit consists of a main glovebox with a robotic arm and sample retrieval mechanism. A sample container magazine is positioned locally at each autosampler unit for dispatching new sample bottles into the main glovebox. Table 9 provides a summary of the PTF and HLW tanks monitored by sampling and analysis.

The autosampling system does not sample the contents of all tanks and miscellaneous units located in black cells or hard-to-reach areas. The following tank and miscellaneous unit contents are not sampled by the autosampling system:

- In the HLW vitrification facility, HOP-VSL-00903 and HOP-VSL-00904 (which are considered to have a higher potential for corrosion and erosion) are in black cells and are not monitored by the facility sampling system. The contents of these tanks are transferred to RLD-VSL-00007, which is monitored by the facility sampling system.
- In the HLW vitrification facility, HOP-WESP-00001 and HOP-WESP-00002 are located in hard-to-reach areas and are not monitored by the facility sampling system. The WESPs drain directly into HOP-VSL-00903 and HOP-VSL-00904.
- In the PTF, CNP-VSL-00003 (which is considered to have a higher potential for corrosion and erosion) is in a black cell and is not monitored by the facility sampling system. However, this tank receives waste only in off-normal operations.
- In the PTF, PWD-VSL-00033 and PWD-VSL-00043 are located in hard-to-reach areas and are not monitored by the facility sampling system. The contents of these tanks are transferred to PWD-VSL-00044, which is monitored by the facility sampling system.

The HLW melters and film coolers, which are designed to be replaced at the end of their 5-year design life, have replaceable melter components (e.g., bubblers, thermowells, glass level detectors) that have a design life of 6 months or 12 months. Review of melter operations and maintenance records at the time of component replacements form the basis for the assessment for the melters.

Operating history review is the only other assessment method suitable for use on underground transfer lines in addition to pneumatic leak tests. Records of waste transfers, transfer line flushes, and leak detections and confirmation of process chemistry conditions assure the integrity of these lines.

7.1.4 Static Liquid Volume Tests

Static liquid volume leak tests are made periodically to ensure that there is no leakage by demonstrating that a tank can maintain its liquid level over a period of time when fluid flow into and out of the tank is stopped. Static liquid tests are performed in accordance with procedures described in API 334 or equivalent guidance documents for tanks.

Static liquid volume leak tests are conducted for tanks located in accessible areas, hot cells, hard-to-reach areas, and black cells. For tanks located in accessible areas and hot cells, these tests are performed as part of the integrity assessment. For tanks located in hard-to-reach areas and black cells, these tests, plus the operating history reviews, are the integrity assessment.

For tanks considered to have a lower potential for corrosion and erosion, static liquid volume leak tests are performed during routine or maintenance outages and within 10 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between tests.

For tanks considered to have a higher potential for corrosion and erosion, the tests are made during routine or maintenance outages and within 7 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between tests.

7.1.5 Non-Destructive Examinations

Pre-operational baseline NDE measurements are performed on DWP regulated plant items before the initial receipt of dangerous waste as described in Section 2.3. Subsequent NDE measurements for accessible regulated plant items are conducted as part of the integrity assessments. The objective of the NDE measurements is to determine the remaining corrosion and erosion allowances of regulated plant items. Results of subsequent NDE measurements on accessible equipment collected during routinely-scheduled integrity assessments will be compared to the baseline NDE measurements to evaluate the structural integrity of equipment and to determine whether the schedule of future assessments should be adjusted. Thickness measurements allow for confirmation that the expected corrosion and erosion rates at the designed operating conditions (including temperature, pH, and chemistry) and erosive conditions (e.g., in discharge and suction path of the PJMs) have not been exceeded and that the equipment-specific corrosion/erosion allowances continue to be adequate to maintain structural integrity for the design life of the equipment.

NDE measurements are to be conducted as part of the integrity assessments for tanks and other regulated plant items designed to pressure vessel standards, for other tanks and miscellaneous units, for piping connected to regulated plant items, and for in-line components. Bulges, sumps, and stainless steel liners do not receive dangerous waste unless there is a leak from a tank, miscellaneous unit, breakpot, piping, or in-line component. For bulges, sumps, and stainless steel liners, NDE measurements are to be conducted as part of the integrity assessments only when the operating history reviews indicate that a leak traveled to and entered these plant items. Operating history reviews and pneumatic leak tests are the only assessment methods suitable for use on underground transfer lines.

DWP-regulated plant items in black cells and hard-to-reach areas in the PTF and HLW vitrification facility are not accessible for NDE measurements following the pre-operational baseline measurements. Where possible, NDE measurements on similar accessible equipment are used as surrogates for NDE measurements on equipment in black cells and hard-to-reach areas. Table 10 provides a summary of accessible equipment in the PTF, LAW vitrification facility, and analytical laboratory that are used as surrogates for NDE measurements for regulated equipment in black cells and hard-to-reach areas in the PTF and HLW vitrification facility, and for the inaccessible hot cell drain collection vessel (RLD-VSL-00165) in the analytical laboratory.

The following criteria were used to identify accessible DWP-regulated equipment for use as surrogates for NDE measurements on inaccessible equipment (in hard-to-reach areas and black cells). In all cases, the surrogate plant item is of the same material as the inaccessible plant item(s).

- Direct correspondence – surrogate receives the same waste, has the same or comparable corrosion allowances, and has the same or similar potential for erosion. For example, the two accessible melter concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) in the LAW vitrification facility that receive treated LAW from the inaccessible treated LAW concentrate storage vessel (TCP-VSL-00001) located in a black cell in the PTF are direct correspondence surrogates for tank TCP-VSL-00001 (same waste as well as same material and corrosion allowance and similar potential for erosion).
- Similar attributes - surrogate receives similar waste, has similar corrosion allowances, and has similar potential for erosion. For example, the two accessible melter concentrate receipt vessels (LCP-VSL-00001 and LCP-VSL-00002) in the LAW vitrification facility that receive treated LAW are similar attribute surrogates for tanks that are part of the LAW pretreatment process immediately upstream

from TCP-VSL-00001. Although inaccessible tanks that receive LAW undergoing pretreatment (CXP-VSL-00001, CXP-VSL-00026A/B/C, and UFP-VSL-00062A/B/C located in black cells in the PTF) do not contain the same waste as LCP-VSL-00001 and LCP-VSL-00002, it is similar waste, while tank materials and corrosion allowance are the same. As a conservative surrogate attribute, the LCP tanks have greater potential for erosion such that if erosion rates in the LCP tanks do not exceed design criteria, erosion rates in similar inaccessible tanks do not exceed design criteria.

- Limited similarity – surrogate receives waste streams different from inaccessible plant items, but has a similar higher potential for corrosion/erosion based on similar pH conditions or mixing process/erosive conditions. For example, the accessible MFVs and MFPVs (LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, and LFP-VLS-00004) in the LAW vitrification facility, which receive treated LAW and glass formers, are potential surrogates for inaccessible tanks with the highest erosion potential due to contents and/or mixing operations. Due to the high potential for erosion, the LAW vitrification facility MFVs and MFPVs are also equipped with increased bottom head and shell thicknesses similar to inaccessible tanks with PJMs. Therefore, LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, and LFP-VSL-00004 are potential surrogates for PTF feed receipt vessels (FRP-VSL-00002A/B/C/D), PTF HLW lag storage vessels (HLP-VSL-00027A/B), and other PTF tanks that have a higher potential for erosion due to contents and/or mixing operations and/or a higher potential for corrosion due to process chemistry.

For accessible equipment, the integrity assessment thickness measurements are conducted at the same locations as the pre-operational baseline thickness measurements. By taking repeated measurements at the same points, the expected remaining corrosion and erosion allowances of the regulated plant items can be more accurately calculated. NDE measurement locations for welds or wall thicknesses are illustrated in Appendix B. These drawings are provided as information becomes available and are to be included in future revisions of this document; a set of drawings will be made available no later than 6 months prior to cold commissioning.

Similar to the baseline thickness measurements, integrity assessment thickness measurements are made in accordance with written procedures implementing the requirements of ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method. Section 9 of ASTM E 797 provides the requirements for developing a detailed written procedure.

7.1.6 Pneumatic Leak Tests of Underground Transfer Lines

Pneumatic tests of secondary containment pipes of the underground transfer lines are made periodically to ensure that there is no leakage by demonstrating that the secondary containment pipes can maintain the test pressure over a period of time. Pneumatic leak tests are performed in accordance with procedures described in ASME B31.3-96 or equivalent guidance documents.

Since the underground transfer lines are not accessible for visual or physical inspections without excavation, the pneumatic leak tests, with the operating history reviews, are the integrity assessment. The underground transfer lines are considered to have a lower potential for corrosion and erosion (Section 6.2). The leak tests are performed during routine or maintenance outages and within 10 years after start of hot commissioning. Subsequent pneumatic leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between tests.

7.1.7 Visual Examinations

Visual examinations (conducted with, or without, the assistance of CCTV) are conducted in accordance with written procedures that conform to the requirements of ASME Section V, Article 9. Visual examinations include:

- Evidence of excessive or uneven settlement of the tank foundation such as distortion and cracks around anchor bolts attaching a tank to an underlying foundation
- Rust, pitting, and other visual evidence of corrosion on the exterior of metal tanks, miscellaneous units, and ancillary equipment (including sumps and stainless steel cell liners in accessible cells), especially at grade level and connections
- Evidence of deterioration of exterior coatings such as rust spots and blisters
- Damage to any insulation being used
- Evidence of possible leaks around the tank, miscellaneous units, or ancillary equipment such as discoloration of coatings
- Cracks or evidence of leaks at joints and welds, especially at connections
- Apparent loss of metal thickness on the tank bottom and sides
- Condition of tank and miscellaneous unit system coatings and linings (including sumps and stainless steel cell liners in accessible cells) including cracks, gaps, swelling, blistering, and crinkling

Visual examinations of accessible piping include:

- Sufficient materials and components, selected at random, to satisfy the examiner that they are free from defects
- At least 5% of welds
- Random examination of threaded, bolted or other joints

A process and mechanical handling monitoring CCTV system provides for remote visual examination of equipment and operations within specified cave and hot cell areas and where the radiation levels are too high for personnel access. Cameras are located to give optimum viewing angles and distance to suit the process where required. Cameras used for process functions can be used to view some regulated equipment but the capability is limited by their locations.

In the PTF, CCTV systems are installed in the following rooms:

- P-0123, hot cell vessels CXP-IXC-00001 through CXP-IXC-00004, UFP-FILT-00001A/B, UFP-FILT-00002A/B, UFP-FILT-00003A/B, UFP-FILT-00004A/B, and UFP-FILT-00005A/B; and miscellaneous units CNP-HX-00001, FEP-RBLR-00001A/B, and TLP-RBLR-00001
- P-0123A, RDMC area tank PIH-TK-00001
- P-0335, filter cave miscellaneous units PJV-DMST-00002A/B/C, PJV-HEPA-00001A/B/C/D/E/F/G, PVP-HEME-00001A/B/C, and PVV-HEPA-00001A/B

In the PTF, to meet in-cell sump inspection requirements, all black cell sumps are equipped with 2-inch diameter guide lines (wall penetrations) for TV camera access.

In the HLW vitrification facility, CCTV systems are installed in the following rooms:

- H-0304A and H-0310A, accessible area tanks HSH-TK-00001 and HSH-TK-00002
- H-0106 and H-0117, melter cave vessels HFP-VSL-00001, HFP-VSL-00002, HFP-VSL-00005, and HFP-VSL-00006
- H-0106 and H-0117, melter cave miscellaneous units HMP-MLTR-00001, HMP-MLTR-00002, HOP-FCLR-00001, HOP-FCLR-00002, HOP-FCLR-00003, HOP-FCLR-00004, HOP-HEME-00001A/B, HOP-HEME-00002A/B, HOP-SCB-00001, and HOP-SCB-00002

7.1.8 Rigid Process Jumpers

The PTF and HLW vitrification facility include equipment referred to as rigid process "jumpers". By definition, this equipment consists of a remotely handled piece of equipment that provides a bridge for service and process lines from either a black cell or hard-to-reach area service or process pipe to a vessel or piece of equipment which is located in a hot cell or melter cave. Within the hot cells and melter caves, most items are designed to be removed and installed using an overhead crane, impact wrenches, and a power manipulator. Operations are monitored using remote cameras and local task lighting deployed on the crane. These limited access operations are facilitated by the connection of all components by the remotely-removable jumpers, which have remotely-manipulated connector heads at either end.

Jumpers are installed as part of the process piping connecting selected regulated plant items, which allows for direct NDE measurements of the jumper piping wall thickness and inspection for corrosion or erosion of piping systems. NDE measurements of remotely-accessible process jumpers may also provide surrogate information for regulated units in black cells that are part of the process stream that flows through the jumpers.

Systems in the PTF with process jumpers include:

- FRP, HLP, RDP, and UFP – jumpers connect black cell tanks and piping to pumps in the hot cell
- FEP and TLP – jumpers connect black cell tanks, miscellaneous units, and piping to pumps in the hot cell
- CNP – jumpers connect black cell tanks and piping to vessel-emptying ejectors and a black cell miscellaneous unit and piping to a pump in the hot cell
- CXP – jumpers connect black cell tanks and piping to vessel-emptying ejectors and pumps in the hot cell

In the PTF, systems with tanks in black cells for which there are no jumpers located in the hot cell include TCP, PVP, and PWD. The TCP tank and piping located in a black cell is connected to a pump in an accessible area. The PVP tank and miscellaneous unit and piping located in a black cell are connected to pumps in bulges. The PWD tanks and piping located in black cells are connected directly to other tanks in black cells or have piping that can be connected by jumper to a vessel-emptying ejector on an as needed basis.

In the HLW, the HOP has process jumpers that connect black cell tanks and piping to miscellaneous units in a hot cell. The RLD tanks and piping located in a black cell are connected directly to breakpots or other tanks in the black cell.

Specific jumpers that may be examined as part of integrity assessment activities are illustrated in Appendix B. These drawings are provided as information becomes available and are to be included in future revisions of this document; a set of drawings will be made available no later than 6 months prior to cold commissioning.

7.2 Assessment Schedule

This section presents the integrity assessment schedule for the regulated plant items in the PTF and HLW vitrification facility. Figure 1 presents a schedule for initial integrity assessments at 7 and 10 years assuming completion of facility construction by 2016.

7.2.1 Frequency of Assessments for Equipment with Lower Potential for Corrosion and Erosion

Assessment of equipment considered to have a lower potential for corrosion and erosion in accessible areas or hot cells is made during routine or maintenance outages and within 10 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken. Subsequent integrity assessments will be based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between integrity assessments. Ten years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required. Table 7 presents the schedule for conducting periodic assessments of regulated plant items located in the PTF and HLW vitrification facility.

With no access into the hard-to-reach areas and black cells during the 40-year life of the WTP, direct visual or physical inspection of equipment considered to have a lower potential for corrosion and erosion are not possible. For these regulated plant items, operating history reviews are performed every 2 years. Static liquid volume leak tests of tanks considered to have a lower potential for corrosion and erosion are performed during routine or maintenance outages and within 10 years after start of hot commissioning. Additionally, NDE measurements conducted on surrogate equipment (see Section 7.1.5) provide information that is representative of corrosion and erosion rates for the inaccessible equipment. Subsequent static liquid volume leak tests will be based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 10 years between tests.

7.2.2 Frequency of Assessment for Equipment with Higher Potential for Corrosion and Erosion

Assessment of equipment that is considered to have a higher potential for corrosion and erosion in accessible areas or hot cells is made during routine or maintenance outages and within 7 years after start of hot commissioning at selected accessible points where baseline NDE measurements had been taken.

Subsequent integrity assessments are based on the results of previous integrity assessments, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between integrity assessments. Because of the potential for increased corrosion and erosion, 7 years is considered long enough to detect anticipated normal corrosion and erosion, but short enough so that if there were significant unanticipated wear due to corrosion or erosion, adequate wall thickness would still remain to prevent failure and corrective actions taken if required. The schedule for conducting periodic assessments of regulated plant items located in the PTF and HLW vitrification facility is provided in Table 7.

With no access into the hard-to-reach areas and black cells during the 40-year life of the WTP, direct visual or physical inspections of equipment considered to have a higher potential for corrosion and erosion are not possible. For these regulated plant items, operating history reviews are performed every 2 years. Static liquid volume leak tests of tanks with higher potential for corrosion and erosion are performed during routine or maintenance outages and within 7 years after start of hot commissioning. Additionally, NDE measurements conducted on surrogate equipment (see Section 7.1.5) provide information that is representative of corrosion and erosion rates for the inaccessible equipment. Subsequent static liquid volume leak tests are based on the results of previous leak tests, the age of the equipment, materials of construction, characteristics of the waste, and any other relevant factors, but there will be no more than 7 years between tests.

7.2.3 Potential Access Impacts on the Assessment Schedule

The majority of the regulated plant items in the PTF and HLW vitrification facility are located in cells that are designated R5/C5 (Table 6). Personnel access is not normally permitted inside these R5/C5 areas. There is no access into R5/C5 areas in hard-to-reach areas and black cells during the 40-year life of the WTP. As conditions allow, and subject to an approval process, R5/C5 areas in accessible areas and hot cells may be downposted to permit access for offnormal conditions and/or equipment maintenance, or for integrity assessments. For example, for accessible areas and hot cells containing tanks, downposting occurs after source term reduction by emptying and flushing the tanks and after contamination reduction inside the accessible areas and hot cells.

The tanks, pumps, and valves in R5/C5 areas located in accessible areas and hot cells receive in-service inspection and surveillance. The tanks, pumps, and valves may be flushed prior to maintenance to reduce radiation fields (dose to personnel).

7.3 Adjustment of Periods Between Assessments

Subsequent assessment intervals may be reduced based on abnormal events (e.g., seismic event resulting in the category III loads [as defined in Section 5 of 24590-WTP-3PS-FB01-T0001] and the design basis events for the PTF and HLW vitrification facility described in 24590-PTF-RPT-ESH-02-002 and 24590-HLW-RPT-ENS-08-002, respectively), process conditions, operating histories, routine inspection results, and corrosion and erosion allowances of the regulated plant item. Adjustment of the period between assessments may be based on the inspection interval calculation(s) described in Section 7.1.2 above.

7.4 Prioritization of Equipment Assessments

Due to the large number of DWP-regulated tanks and miscellaneous units and their associated ancillary equipment, prioritization of the order in which integrity assessments for DWP-regulated items are

conducted is required. Figure 1 presents the overall schedule for DWP-regulated equipment integrity assessments, which are to be conducted at intervals of either 7 years or 10 years after hot commissioning as designated in Table 7. Appendix C provides a prioritized contingent schedule for assessment of DWP-regulated equipment in the PTF and HLW vitrification facility. The prioritization is contingent upon the as-built layout of the facilities and actual operation requirements.

In general, the order for equipment to undergo integrity assessments follows the waste treatment process, with the following considerations:

- equipment in black cells and hard-to-reach areas is assessed first
- equipment used as NDE surrogates is assessed before or at the same time as corresponding equipment in black cells or hard-to-reach areas
- equipment containing LAW or HLW is assessed before equipment containing condensate or offgases
- process equipment is assessed before PWD equipment
- larger tanks are assessed before small tanks or breakpots
- sumps in rooms with no DWP-regulated tanks or miscellaneous units are assessed last unless they are used as NDE surrogates

For example, for the PTF equipment designated for initial assessment 7 years after hot commissioning (Table 7), the contingent priority order follows the waste treatment process with the first equipment undergoing assessment consisting of the FRP tanks in black cells, which receive untreated waste from the tank farms and which are also the largest tanks. The last equipment undergoing assessment consists of sumps in black cells that contain no tanks or equipment being assessed at 7 years; sumps in the hot cell; and tank RDP-VSL-00004, which is located in an accessible area.

The LAW vitrification facility and PTF equipment that is used as NDE surrogates (Table 10) undergo integrity assessments before or at the same time as the corresponding equipment in black cells or hard-to-reach areas.

7.5 Reporting

Upon completion of a periodic integrity assessment, the IQRPE reviews the data obtained from routine inspections, operating history reviews, static liquid volume tests, ultrasonic thickness testing, pneumatic leak testing, and visual examinations. The IQRPE prepares a report of assessment results. The report of assessment results is reviewed and certified. The certification includes the following statement from WAC 173-303-810(13)(a): "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The report of assessment results includes: an introduction describing the scope and objectives of the assessment; the methods used to conduct the assessment; the results of the assessment; and the

conclusions of the assessment including recommendations regarding the time interval before the next integrity assessment.

Reports of the results of operating history reviews include the following information:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
  - minimum
  - maximum
  - average
  - standard deviation
- Examination personnel identity and qualifications

The reports of results of static liquid volume tests include:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
  - minimum
  - maximum
  - average
  - standard deviation
- Examination personnel identity and qualifications

Reports of the results of ultrasonic thickness testing include the following information:

- Date of the examination
- Examination procedure
- Type of instrument
- Standardization blocks, size and material type
- Size, frequency and type of search unit
- Scanning method
- Results
- Maximum and minimum thickness measurements
- Location of measurements
- Personnel data, certification level

Reports of the results of pneumatic leak testing of underground transfer lines include the following information:

- Date of the examination
- Procedure and revision used
- Type of instrument
- Test medium
- Location of measurements
- Start and finish times, temperatures, and pressures
- Results of the examination
- Examination personnel identity and qualifications

The reports of results of visual (conducted with or without use of CCTV) examinations include:

- Date of the examination
- Procedure and revision used
- Technique used
- Results of the examination
- Examination personnel identity and qualifications

Reports of assessment results are collected, maintained, and stored in accordance with 24590-WTP-GPP-PADC-002, *Project Records Management.*

7.6 Contingency Action

If the integrity assessment program detects problems with a regulated plant item, the contingency plan will be followed. The contingency plan provides a detailed description of procedures that will be implemented for compliance with WAC 173-303-640(7) as required by Dangerous Waste Permit Condition III.10.C.6.b.

8 References for Applicable Codes and Regulations

10 CFR 835, Occupational Radiation Protection, Code of Federal Regulations, as amended

American Bearing Manufacturers Association (ABMA) Standard 7, Shaft and Housing Fits for Metric Radial Ball and Roller Bearings

ABMA 9, Load Ratings and Fatigue Life for Ball Bearings

ABMA Standard 11, Load Ratings and Fatigue Life for Roller Bearings

ABMA Standard 20, Radial Bearings of Ball, Cylindrical Roller, and Spherical Roller Types Metric Design

American Institute for Steel Construction Inc. (AISC) M016-89, Manual of Steel Construction

Air Movement and Control Association (AMCA) 201, Fans and Systems

AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

AMCA 300, Reverberant Room Methods for Sound Testing of Fans

American National Standards Institute/American Institute for Steel Construction Inc. (ANSI/AISC) N690, Specifications for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities

American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) B15.1, Safety Standard for Mechanical Power Transmission Apparatus

ANSI/ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings

ANSI/ASME B16.5, Pipe Flanges and Flanged Fittings

American National Standards Institute/Hydraulic Institute Standards (ANSI/HI) 9.6.4, Centrifugal/Vertical Vibration

American Petroleum Institute (API) 334, A Guide to Leak Detection for Aboveground Storage Tanks

API 610, Centrifugal Pumps for General Refinery Service

API 650, Welded Steel Tanks for Oil Storage

API 676, Positive Displacement Pumps - Rotary

API 685, Sealless Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services

American Society of Mechanical Engineers (ASME) AG-1, Code on Nuclear Air and Gas Treatment

ASME B31.3-96, Process Piping

ASME B73.1M, Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process

ASME B73.2M, Specifications for Vertical In-Line Centrifugal Pumps for Chemical Process

ASME Section V Boiler and Pressure Vessel Code, Nondestructive Examination

ASME Section VIII Boiler and Pressure Vessel Code, Division 1, Pressure Vessels

ASME Section IX Boiler and Pressure Vessel Code, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

American Society of Mechanical Engineers/American National Standards Institute (ASME/ANSI) Y14.5M, Dimensioning and Tolerancing

American Society for Nondestructive Testing, Inc. (SNT), Recommended Practice No. SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing

ASTM E 165-02 Standard Test Method for Liquid Penetrant Examination

ASTM E 797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method

Hydraulic Institute Standards (HI) 2.6, American National Standard for Vertical Pump Tests

Washington Administrative Code (WAC) 173-303, Dangerous Waste Regulations, as amended

Table 1 Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
PTF Tanks		
Cesium Evaporator Eluant Lute Pot	CNP-VSL-00001	ASME Section VIII Division 1
Eluate Contingency Storage Vessel	CNP-VSL-00003	ASME Section VIII Division 1
Cesium Evaporator Recovered Nitric Acid Vessel	CNP-VSL-00004	ASME Section VIII Division 1
Cesium Ion Exchange Columns	CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004	ASME Section VIII Division 1
Cesium Ion Exchange Feed Vessel	CXP-VSL-00001	ASME Section VIII Division 1
Ion Exchange Caustic Rinse Collection Vessel	CXP-VSL-00004	ASME Section VIII Division 1
Cesium Ion Exchange Reagent Vessel	CXP-VSL-00005	ASME Section VIII Division 1
Ion Exchange Treated LAW Collection Vessels	CXP-VSL-00026A/B/C	ASME Section VIII Division 1
Waste Feed Evaporator Feed Vessels	FEP-VSL-00017A/B	ASME Section VIII Division 1
Waste Feed Evaporator Condensate Vessel	FEP-VSL-00005	ASME Section VIII Division 1
Waste Feed Receipt Vessels	FRP-VSL-00002A/B/C/D	ASME Section VIII Division 1
HLW Feed Blend Vessel	HLP-VSL-00028	ASME Section VIII Division 1
HLW Lag Storage Vessels	HLP-VSL-00027A/B	ASME Section VIII Division 1
HLW Feed Receipt Vessel	HLP-VSL-00022	ASME Section VIII Division 1
Decontamination Soak Tank	PIH-TK-00001	API 620
Vessel Ventilation HEME Drain Collection Vessel	PVP-VSL-00001	ASME Section VIII Division 1
Ultimate Overflow Vessel	PWD-VSL-00033	ASME Section VIII Division 1
HLW Effluent Transfer Vessel	PWD-VSL-00043	ASME Section VIII Division 1
C3 Floor Drain Collection Vessel	PWD-VSL-00046	ASME Section VIII Division 1
Acidic/Alkaline Effluent Vessels	PWD-VSL-00015 PWD-VSL-00016	ASME Section VIII Division 1
Plant Wash Vessel	PWD-VSL-00044	ASME Section VIII Division 1
Spent Resin Slurry Vessels	RDP-VSL-00002A/B/C	ASME Section VIII Division 1
Spent Resin Dewatering Moisture Sep. Vessel	RDP-VSL-00004	ASME Section VIII Division 1
Process Condensate Tanks	RLD-TK-00006A/B	API 650
Alkaline Effluent Vessels	RLD-VSL-00017A/B	ASME Section VIII Division 1
Treated LAW Concentrate Storage Vessel	TCP-VSL-00001	ASME Section VIII Division 1
Treated LAW Evaporator Condensate Vessel	TLP-VSL-00002	ASME Section VIII Division 1
LAW SBS Condensate Receipt Vessels	TLP-VSL-00009A/B	ASME Section VIII Division 1
Ultrafilter Permeate Vessels	UFP-VSL-00062A/B/C	ASME Section VIII Division 1
Ultrafiltration Feed Preparation Vessels	UFP-VSL-00001A/B	ASME Section VIII Division 1
Ultrafiltration Feed Vessels	UFP-VSL-00002A/B	ASME Section VIII Division 1
Ultrafilters	UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B	ASME Section VIII Division 1
PTF Miscellaneous Units		
Cesium Evaporator Separator Vessel	CNP-EVAP-00001	ASME Section VIII Division 1
Cesium Evaporator Concentrate Reboiler	CNP-HX-00001	ASME Section VIII Division 1

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Cesium Nitric Acid Rectifier	CNP-DISTC-00001	ASME Section VIII Division 1
Cesium Evaporator Primary Condenser	CNP-HX-00002	ASME Section VIII Division 1
Cesium Evaporator Intercondenser	CNP-HX-00003	ASME Section VIII Division 1
Cesium Evaporator Aftercondenser	CNP-HX-00004	ASME Section VIII Division 1
Waste Feed Evaporator Separator Vessels	FEP-SEP-00001A/B	ASME Section VIII Division 1
Waste Feed Evaporator Reboilers	FEP-RBLR-00001A/B	ASME Section VIII Division 1
Waste Feed Evaporator Primary Condensers	FEP-COND-00001A/B	ASME Section VIII Division 1
Waste Feed Evaporator Intercondensers	FEP-COND-00002A/B	ASME Section VIII Division 1
Waste Feed Evaporator Aftercondensers	FEP-COND-00003A/B	ASME Section VIII Division 1
PJV Primary Exhaust HEPA Filters	PJV-HEPA-00001A/B/C/D/E/F/G	ASME AG-1
PJV Secondary Exhaust HEPA Filters	PJV-HEPA-00002A/B/C/D/E/F	ASME AG-1
PJV Exhaust Fans	PJV-FAN-00001A/B/C	ASME AG-1
PJV Demisters	PJV-DMST-00002A/B/C	ASME Section VIII Division 1
Carbon Bed Adsorbers	PVP-ADBR-00001A/B	ASME Section VIII Division 1
After Cooler	PVP-CLR-00001	ASME Section VIII Division 1
VOC Oxidizer Unit	PVP-OXID-00001	NA
Adsorber Outlet Filter	PVP-FILT-00001	ASME Section VIII Division 1
HEME Filters	PVP-HEME-00001A/B/C	ASME Section VIII Division 1
Scrubbing Liquid Cooler	PVP-HX-00002	ASME Section VIII Division 1
Caustic Scrubber	PVP-SCB-00002	ASME Section VIII Division 1
Primary HEPA Filters	PVV-HEPA-00001A/B	ASME AG-1
Secondary HEPA Filters	PVV-HEPA-00002A/B	ASME AG-1
Exhaust Fans	PVV-FAN-00001A/B	ASME AG-1
Treated LAW Evaporator Separator Vessel	TLP-SEP-00001	ASME Section VIII Division 1
Treated LAW Evaporator Reboiler	TLP-RBLR-00001	ASME Section VIII Division 1
Treated LAW Evap. Primary Condenser	TLP-COND-00001	ASME Section VIII Division 1
Treated LAW Evaporator Intercondenser	TLP-COND-00002	ASME Section VIII Division 1
Treated LAW Evaporator Aftercondenser	TLP-COND-00003	ASME Section VIII Division 1
PTF Breakpots and Pulsepots		
Cesium Concentrate Breakpot	CNP-BRKPT-00001	ASME Section VIII Division 1
Cesium Evaporator Eluate Breakpot	CNP-BRKPT-00002	ASME Section VIII Division 1
Cesium Concentrate Receipt Breakpots	HLP-BRKPT-00004 HLP-BRKPT-00006	ASME Section VIII Division 1
Plant Wash Breakpots	PWD-BRKPT-00007 PWD-BRKPT-00008 PWD-BRKPT-00009 PWD-BRKPT-00010 PWD-BRKPT-00017 PWD-BRKPT-00019	ASME Section VIII Division 1
Acidic/Alkaline Effluent Breakpots	PWD-BRKPT-00015 PWD-BRKPT-00016	ASME Section VIII Division 1
Ultrafiltration Recycle Breakpots	UFP-BRKPT-00001B	ASME Section VIII Division 1
Ultrafiltration Pulsepots	UFP-PP-00001A/B UFP-PP-00002A/B UFP-PP-00003A/B	ASME Section VIII Division 1

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
PTF Bulges		
Cesium Resin Addition Bulge	CRP-BULGE-00001	ANSI/AISC N690-94
Cesium IX Process Bulge	CXP-BULGE-00004	AISC M016-89
Vessel Vent Caustic Scrubber Transfer Pump Bulge	PVP-BULGE-00001	ANSI/AISC N690-94
Vessel Vent HEME Drain Vessel Pump Bulge	PVP-BULGE-00002	ANSI/AISC N690-94
Vessel Vent Heat Exchanger Bulge	PVP-BULGE-00014	AISC M016-89
Process Bulge	TCP-BULGE-00004	ANSI/AISC N690-94
Ultrafiltration Reagent Bulges	UFP-BULGE-00001 UFP-BULGE-00002	AISC M016-89
Ultrafiltration Utility Bulges	UFP-BULGE-00005 UFP-BULGE-00006	ANSI/AISC N690-94
High Point Vent Bulges	PVP-BULGE-00019 PVP-BULGE-00020 PVP-BULGE-00021	ANSI/AISC N690-94
PTF Sumps and Piping		
Black Cell Sumps	PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A PWD-SUMP-00003 PWD-SUMP-00004 PWD-SUMP-00005 PWD-SUMP-00006 PWD-SUMP-00007 PWD-SUMP-00008 PWD-SUMP-00009 PWD-SUMP-00010 PWD-SUMP-00011 PWD-SUMP-00012 PWD-SUMP-00013	ANSI/AISC N690 AISC M016-89
Hot Cell Sumps	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029	ANSI/AISC N690 AISC M016-89
Maintenance Cave Sumps	PWD-SUMP-00032 PWD-SUMP-00033	ANSI/AISC N690 AISC M016-89
Other PWD Sumps	PWD-SUMP-00034 PWD-SUMP-00035	ANSI/AISC N690 AISC M016-89
Alkaline Effluent Collection Area Sump	PWD-SUMP-00036	ANSI/AISC N690 AISC M016-89
-45-ft Pit Sump	PWD-SUMP-00040	ANSI/AISC N690 AISC M016-89
C2/C3 Drains Pit Sump	PWD-SUMP-00071	NA
RLD Containment Area Sump	RLD-SUMP-00003	NA

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Piping	NA	ASME B31.3-96
PTF Pumps		
Cesium Nitric Acid Recovery Process Recirculation Pump	CNP-PMP-00001	API 610, 8th Edition
Process Condensate Return Pump	CNP-PMP-00002	manufacturer standard
Cesium Ion Exchange Feed Pumps	CXP-PMP-00001A/B	API 685 ASME Section VIII, Division I ASME Section IX (and other requirements specified in 24590-WTP-3PS-MPC0-T0003)
Treated LAW Feed Pumps	CXP-PMP-00002A/B	API 685 ASME Section VIII, Division I ASME Section IX (and other requirements specified in 24590-WTP-3PS-MPC0-T0003)
Waste Feed Evaporator Process Condensate Pumps	FEP-PMP-00006A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Waste Feed Evaporator Feed Pumps	FEP-PMP-00007A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
Waste Feed Evaporator Concentrate Pumps	FEP-PMP-00008A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
Waste Feed Evaporator System Recirculation Pumps	FEP-PMP-00009A/B	API 610, 8th Edition

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Waste Feed Return Pump	FRP-PMP-00001	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
Waste Feed Transfer Pump	FRP-PMP-00002A	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
HLW Solids Transfer Pumps	HLP-PMP-00017A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
HLW Melter Feed Pumps	HLP-PMP-00019A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
HLW Feed Receipt Transfer Pump	HLP-PMP-00021	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Vessel Vent Scrubber Recirculating Pumps	PVP-PMP-00001A/B	API 685 ASME Section VIII, Division I ASME Section IX (and other requirements specified in 24590-WTP-3PS-MPC0-T0003)
HEME Drain Collection Vessel Pumps	PVP-PMP-00002A/B	API 685 ASME Section VIII, Division I ASME Section IX (and other requirements specified in 24590-WTP-3PS-MPC0-T0003)
C3 Area Floor Drains Transfer Pumps	PWD-PMP-00024A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Spent Resin Slurry Pumps	RDP-PMP-00008A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
Spent Resin Dewatering Pump	RDP-PMP-00011	manufacturer standard
Alkaline Effluent Pumps	RLD-PMP-00005A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Process Condensate Pumps	RLD-PMP-00011A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Process Condensate Recirculation Pumps	RLD-PMP-00012A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Process Condensate Distribution Pumps	RLD-PMP-00014A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Treated LAW Concentrate Transfer Pumps	TCP-PMP-00001A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002) vendor design
Treated LAW Evaporator System Recirculation Pump	TLP-PMP-00001	API 610, 8th Edition
Treated LAW Evaporator Process Condensate Pumps	TLP-PMP-00002A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Treated LAW Evaporator System Feed Pumps	TLP-PMP-00005A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Treated LAW Evaporator System Concentrate Pumps	TLP-PMP-00011A/B	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Concentrate Transfer Pumps	UFP-PMP-00041A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
Ultrafiltration Recirculation Pumps	UFP-PMP-00042A/B UFP-PMP-00043A/B	API 610, 8th Edition ASME Section VIII Division 1 ASME Section IX ASME/ANSI Y14.5M AISC M016-89, 9th Edition ANSI/HI 9.6.4, 2000 (and other requirements specified in 24590-PTF-3PS-MPC0-T0001)
Progressive Cavity Pumps	UFP-PMP-00044A/B	API 676
HLW Tanks		
Rinse Tunnel Canister Rinse Vessel	HDH-VSL-00001	ASME Section VIII Division 1
Waste Neutralization Vessel	HDH-VSL-00003	ASME Section VIII Division 1
Canister Decon Vessel 1	HDH-VSL-00002	ASME Section VIII Division 1
Canister Decon Vessel 2	HDH-VSL-00004	ASME Section VIII Division 1
Melter 1 Feed Preparation Vessel	HFP-VSL-00001	ASME Section VIII Division 1
Melter 1 Feed Vessel	HFP-VSL-00002	ASME Section VIII Division 1
Melter 2 Feed Preparation Vessel	HFP-VSL-00005	ASME Section VIII Division 1
Melter 2 Feed Vessel	HFP-VSL-00006	ASME Section VIII Division 1
SBS Condensate Receiver Vessel No. 1	HOP-VSL-00903	ASME Section VIII Division 1

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
SBS Condensate Receiver Vessel No. 2	HOP-VSL-00904	ASME Section VIII Division 1
Decontamination Tank Melter Cave 1	HSH-TK-00001	API 620
Decontamination Tank Melter Cave 2	HSH-TK-00002	API 620
Acidic Waste Vessel	RLD-VSL-00007	ASME Section VIII Division 1
Plant Wash and Drains Vessel	RLD-VSL-00008	ASME Section VIII Division 1
Offgas Drains Collection Vessel	RLD-VSL-00002	ASME Section VIII Division 1
HLW Miscellaneous Units		
Melter 1	HMP-MLTR-00001	ASME Section VIII ASME B31.3-96
Melter 2	HMP-MLTR-00002	ASME Section VIII ASME B31.3-96
Wet Electrostatic Precipitators	HOP-WESP-00001 HOP-WESP-00002	ASME Section VIII Division 1
Thermal Catalytic Oxidizers	HOP-SCO-00001 HOP-SCO-00004	ASME Section VIII ASME B31.3-96 AISC M016-89
NO_x Selective Catalytic Reducers	HOP-SCR-00001 HOP-SCR-00002	ASME Section VIII ASME B31.3-96 AISC M016-89
Silver Mordenite Columns	HOP-ABS-00002 HOP-ABS-00003	ASME Section VIII Division 1; ASME AG-1/1a
Film Coolers	HOP-FCLR-00001 HOP-FCLR-00002 HOP-FCLR-00003 HOP-FCLR-00004	NA
HEPA Filters	HOP-HEPA-00001A/B HOP-HEPA-00002A/B HOP-HEPA-00007A/B HOP-HEPA-00008A/B	ASME AG-1
HEPA Electric Preheaters	HOP-HTR-00001B HOP-HTR-00002A	ASME Section VIII Division 1; ASME AG-1
HEPA Electric Preheaters, Melter 2	HOP-HTR-00005A/B	ASME Section VIII Division 1; ASME AG-1
Catalyst Skid Electric Heaters	HOP-HTR-00001 HOP-HTR-00007	NA
Catalyst Skid Preheaters	HOP-HX-00001 HOP-HX-00003	NA
Silver Mordenite Preheaters	HOP-HX-00002 HOP-HX-00004	ASME Section VIII Division 1
Booster Extraction Fans	HOP-FAN-00001A/B/C HOP-FAN-00009A/B/C	ASME AG-1
Stack Extraction Fans	HOP-FAN-00008A/B/C HOP-FAN-00010A/B/C	ASME AG-1
Activated Carbon Adsorbers	HOP-ADBR-00001A/B HOP-ADBR-00002A/B	ASME Section VIII Division 1; ASME AG-1
HEMEs	HOP-HEME-00001A/B HOP-HEME-00002A/B	ASME Section VIII Division 1

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Submerged Bed Scrubbers	HOP-SCB-00001 HOP-SCB-00002	ASME Section VIII Division 1
HEPA Filters	PJV-HEPA-00004A/B PJV-HEPA-00005A/B	ASME AG-1
Electric Heater	PJV-HTR-00002	ASME Section VIII Division 1
Pulse Jet Fans	PJV-FAN-00002A/B	ASME AG-1
HLW Breakpots		
Plant Wash and Drains Vessel Transfer Breakpot	RLD-BRKPT-00004	ASME Section VIII Division 1
Acidic Waste Vessel Transfer Breakpots	RLD-BRKPT-00007 RLD-BRKPT-00009	ASME Section VIII Division 1
HLW Sumps and Piping		
Sumps	HFP-SUMP-00001 HFP-SUMP-00004 HFP-SUMP-00002 HFP-SUMP-00005 HOP-SUMP-00003 HOP-SUMP-00008 HSH-SUMP-00003 HSH-SUMP-00007 HSH-SUMP-00008 HSH-SUMP-00009 HDH-SUMP-00001 HDH-SUMP-00002 HDH-SUMP-00003 RLD-SUMP-00001 HCP-SUMP-00001 HPH-SUMP-00001 HPH-SUMP-00003 HPH-SUMP-00005	ANSI/AISC N690 AISC M016-89
Piping	NA	ASME B31.3-96
HLW Pumps		
Canister Rinse Bogie Pump	HDH-PMP-00001	ASME Section VIII, Division I ASME Section IX ANSI/ABMA 9 and 11 ANSI/ASME B15.1, B16.1, B16.5, B73.1M, and B73.2M ASME/ANSI Y14.5M (and other requirements specified in 24590-WTP-3PS-MPC0-T0002)
Feed Air Displacement Slurry Pumps	HFP-PMP-00001 HFP-PMP-00002 HFP-PMP-00014 HFP-PMP-00015	manufacturer standard

Table 1 (cont'd) Summary of Design Codes

Plant Item Name	Plant Item Number	Design Code
Melters 1 and 2 Feed Preparation Vessels Sample/Transfer Pumps	HFP-PMP-00005A/B HFP-PMP-00018A/B	ABMA 7, 9, and 20 API 610, 8th Edition ASME Section V ASME Section IX ASME/ANSI Y14.5M HI 2.6 (and other requirements specified in 24590-WTP-3PS-MPC0-T0009)
Melters 1 and 2 Feed Vessels Sample/Recirculation Pumps	HFP-PMP-00007 HFP-PMP-00017	ABMA 7, 9, and 20 API 610, 8th Edition ASME Section V ASME Section IX ASME/ANSI Y14.5M HI 2.6 (and other requirements specified in 24590-WTP-3PS-MPC0-T0009)
Decontamination Tank Recirculation Pumps	HSH-PMP-00001 HSH-PMP-00002	manufacturer standard
Bogie Decon Room Sump Pump	RLD-PMP-00023	manufacturer standard
Underground Transfer Lines		
Piping	NA	ASME B31.3-96

Acronyms:

ABMA – American Bearing Manufacturers Association
AISC – American Institute of Steel Construction
ANSI – American National Standards Institute
API - American Petroleum Institute
ASME - American Society of Mechanical Engineers
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HI – Hydraulic Institute Standards
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NO_x - nitrogen oxides
PJV – pulse jet ventilation system
PTF - pretreatment facility
SBS - submerged bed scrubber
VOC - volatile organic compound

Table 2 Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
PTF Tanks			
CNP-VSL-00001	radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CNP-VSL-00003	Cs eluant / concentrate	vessel: 316L (S31603) (max 0.030% C; dual certified[2]), or better; jacket: 304L (S30403) (max 0.030% C; dual certified), or better	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.016-inch localized protection required for bottom head to accommodate PJM discharge velocities)
CNP-VSL-00004	recovered nitric acid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004	LAW and resin	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CXP-VSL-00001	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CXP-VSL-00004	sodium hydroxide rinse	304L (S30403) (max 0.030% C; dual certified)	0.40 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CXP-VSL-00005	sodium hydroxide/ water/ nitric acid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CXP-VSL-00026A/B/C	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
FEP-VSL-00017A/B	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes no erosion allowance; additional 0.094-inch localized protection required for bottom head to accommodate PJM discharge velocities)
FEP-VSL-00005	process condensate	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
FRP-VSL-00002A/B/C/D	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes no erosion allowance; additional 0.044-inch localized protection required for bottom head to accommodate PJM discharge velocities)

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
HLP-VSL-00028	radioactive slurry	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (additional 0.434-inch localized protection required for bottom head to accommodate PJM discharge velocities)
HLP-VSL-00027A/B	radioactive slurry	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.436-inch localized protection required for bottom head to accommodate PJM discharge velocities)
HLP-VSL-00022	radioactive slurry	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.398-inch localized protection required for bottom head to accommodate PJM discharge velocities)
PIH-TK-00001	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes no erosion allowance)
PVP-VSL-00001	radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
PWD-VSL-00033	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.083-inch localized protection required for bottom head to accommodate PJM discharge velocities)
PWD-VSL-00043	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.080 inch
PWD-VSL-00046	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
PWD-VSL-00015	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.093-inch localized protection required for bottom head to accommodate PJM discharge velocities)

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
PWD-VSL-00016	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.077-inch localized protection required for bottom head to accommodate PJM discharge velocities)
PWD-VSL-00044	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.067-inch localized protection required for bottom head to accommodate PJM discharge velocities)
RDP-VSL-00002A/B/C	spent CXP ion exchange resin	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.060-inch localized protection required for bottom head to accommodate PJM discharge velocities)
RDP-VSL-00004	radioactive water	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes no erosion allowance)
RLD-TK-00006A/B	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
RLD-VSL-00017A/B	radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.080 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
TCP-VSL-00001	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.164-inch localized protection required for bottom head to accommodate PJM discharge velocities)
TLP-VSL-00002	radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
TLP-VSL-00009A/B	radioactive liquid	6% molybdenum alloy (N08367/N08926)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.056-inch localized protection required for bottom head to accommodate PJM discharge velocities)

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
UFP-VSL-00062A/B/C	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
UFP-VSL-00001A/B	radioactive slurry	vessel: 316L (S31603) (max 0.030% C; dual certified) steam ejector/high temp components located inside vessel: Alloy C-22 (N06022)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance; additional 0.129-inch localized protection required for bottom head to accommodate PJM discharge velocities)
UFP-VSL-00002A/B	radioactive slurry	vessel: 304L (S30403) (max 0.030% C; dual certified); steam ejector/high temp components located inside vessel: Alloy C-22 (N06022)	0.040 inch (includes no erosion allowance; additional 0.517-inch localized protection required for bottom head to accommodate PJM discharge velocities)
UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B	radioactive slurry	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance)
PTF Miscellaneous Units			
CNP-EVAP-00001	radioactive liquid	Alloy C-22 (N06022)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CNP-HX-00001	water and nitric acid	tube-side: Alloy C-22 (N06022); shell-side (steam): 316L (S31603) (max 0.030% C; dual certified)	shell side and tube side; 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
CNP-DISTC-00001	water vapor and gases	6% molybdenum alloy (N08367/N08926)	0.040 inch (includes no erosion allowance)
CNP-HX-00002 CNP-HX-00003 CNP-HX-00004	water vapor and gases	304L (S30403) (max 0.030% C; dual certified)	shell side and tube side: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
FEP-SEP-00001A/B	radioactive slurry	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes no erosion allowance)
FEP-RBLR-00001A/B	LAW waste feed recirculation	shell: 304L (S30403) (max 0.030%C; dual certified); tubes: Hastelloy G-30 Alloy (N06030) or equivalent	none on shell side 0.040 inch on tube side
FEP-COND-00001A/B FEP-COND-00002A/B FEP-COND-00003A/B	water vapor and gases	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
PJV-HEPA-00001A/B/C/D/E/F/G	PJV exhaust vapor	vendor package housing: 304L (S30403)	NA

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
PJV-HEPA-00002A/B/C/D/E/F	PJV exhaust vapor	vendor package housing: 304L (S30403)	NA
PJV-FAN-00001A/B/C	PJV exhaust vapor	vendor package housing: stainless steel	NA
PJV-DMST-00002A/B/C	PJV exhaust vapor	304L (S30403) (max 0.030% C; dual certified)	0.040 inch
PVP-ADBR-00001A/B	filtered vent gas	316L (S31603) (max 0.030% C; dual certified)	NA
PVP-CLR-00001	filtered vent gas from the oxidizer	housing: 304L (S30403)	0.040 inch (shell side and tube side) (includes no erosion allowance)
PVP-OXID-00001	vent gas from the HEPA filters	housing: 316L (S31603)	housing: 0.0625 inch
PVP-FILT-00001	filtered vent gas from the carbon absorbers	housing: 316L (S31603)	0.040 inch
PVP-HEME-00001A/B/C	caustic scrubber offgas	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
PVP-HX-00002	scrubber solution and chilled water	316L (S31603)	none required
PVP-SCB-00002	radioactive liquid	column: 316L (S31603) (max 0.030% C; dual certified); column packing and demister packing: 6% molybdenum alloy (N08367)	column: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) column packing and demister packing: none required
PVV-HEPA-00001A/B PVV-HEPA-00002A/B	outlet vapors from the HEME filters	vendor package housing: 304L (S30403)	NA
PVV-FAN-00001A/B	filtered vent gas	stainless steel	NA
TLP-SEP-00001	radioactive slurry	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
TLP-RBLR-00001	steam and cooling water	shell: 304L (S30403) (max 0.030%C; dual certified); tubes: Hastelloy G-30 Alloy (N06030) or equivalent	tube side: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) shell side: none required
TLP-COND-00001 TLP-COND-00002 TLP-COND-00003	water vapor and gases	316L (S31603) (max 0.030% C; dual certified)	shell side: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance) tube side: none required

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
PTF Breakpots and Pulsepots			
CNP-BRKPT-00001 CNP-BRKPT-00002	radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
HLP-BRKPT-00004 HLP-BRKPT-00006	cesium concentrate	Alloy C-22 (N06022)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance)
PWD-BRKPT-00007 PWD-BRKPT-00009 PWD-BRKPT-00008 PWD-BRKPT-00010	water, possibly radioactive	316L (S31603) (max 0.030% C, dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
PWD-BRKPT-00017 PWD-BRKPT-00019	water, possibly radioactive	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
PWD-BRKPT-00015 PWD-BRKPT-00016	acid/caustic effluent	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
UFP-BRKPT-00001B	radioactive liquid	316L (S31603) (max 0.030% C, dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance)
UFP-PP-00001A/B UFP-PP-00002A/B UFP-PP-00003A/B	reagents and radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance)
PTF Bulges			
CRP-BULGE-00001	cesium resin	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
CXP-BULGE-00004	spent resin and radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
PVP-BULGE-00001 PVP-BULGE-00002 PVP-BULGE-00014	caustic radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
TCP-BULGE-00004	treated LAW and radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
UFP-BULGE-00001 UFP-BULGE-00002	reagents and water	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
UFP-BULGE-00005 UFP-BULGE-00006	condensate	316L (S31603) (max 0.030% C; dual certified)	0.040 inch

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
PTF Sumps			
PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A PWD-SUMP-00003 PWD-SUMP-00004 PWD-SUMP-00005 PWD-SUMP-00006 PWD-SUMP-00007 PWD-SUMP-00008 PWD-SUMP-00009 PWD-SUMP-00010 PWD-SUMP-00011 PWD-SUMP-00012 PWD-SUMP-00013 PWD-SUMP-00031 PWD-SUMP-00034 PWD-SUMP-00035 PWD-SUMP-00036	various	304L (S30403) (max 0.030% C; dual certified)	0.040 inch
PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029 PWD-SUMP-00032 PWD-SUMP-00033	various	316L (S31603) (max 0.030% C; dual certified)	0.040 inch
PWD-SUMP-00040	various	6% molybdenum alloy (N08367)	0.040 inch
PWD-SUMP-00071	C2/C3 drains	epoxy SPC	NA
RLD-SUMP-00003	water	epoxy SPC	NA
PTF Piping			
Systems with highly corrosive fluids in high active cells	nitric acid vapors	6% molybdenum alloy (N08367)	0.0425 inch
Systems with highly corrosive fluids in high active cells	Cs eluate	Alloy C-22 (N06022)	0.040 inch
Systems with less than 2% solids and greater than 20% nitric acid	recovered nitric acid, C3 floor drains	304L (S30403)	0.040 inch
Systems with more than 2% solids and greater than 20% nitric acid	waste feed	304L (S30403)	0.0937 inch
Systems with high erosion solids	UFP concentrate recycle	304L (S30403)	0.125 inch

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
Systems with less than 2% solids and less than 20% nitric acid	waste feed, PVP exhaust, alkaline effluent, water vapor and condensate	316L (S31603)	0.040 inch
Systems with more than 2% solids and less than 20% nitric acid	waste feed	316L (S31603)	0.0937 inch
PTF Pumps			
CNP-PMP-00001	radioactive liquid	housing, impeller, shaft, sleeve: Inconel 625 (N06625); non-wetted parts: 316L (S31603)	0.040 inch
CNP-PMP-00002	water vapor and gases	vendor package	manufacturer standard
CXP-PMP-00001A/B	radioactive liquid	housing/barrel, impeller: ASTM A351Gr CD4MCu (J93370); case/impeller wear rings: Nitronic 60 (Alloy 218) (S21800); shaft: ASTM A276 (Alloy 2205) (S31803); base: 316L (S31603)	0.040 inch
CXP-PMP-00002A/B	radioactive liquid	housing, shaft, impeller, containment shell/stator liner, inner sheathing/rotor liner: 316L (S31603)	0.125 inch
FEP-PMP-00006A/B	process condensate	housing, impeller, sleeve: 316L (S31603); shaft: SAE 4140 (G41400) (Cr-molybdenum steel)	0.040 inch
FEP-PMP-00007A/B	radioactive liquid	housing, impeller: CD4MCu (J93370) or better	0.040 inch
FEP-PMP-00008A/B	radioactive slurry	housing, impeller: CD4MCu (J93370) or better	0.040 inch
FEP-PMP-00009A/B	LAW waste feed recirculation	housing: 316L (S31603); impeller: ASTM A351 CN3MN (J94651); shaft: 6% molybdenum alloy (N08367); flange studs: Nitronic 60 (Alloy 218) (S21800)	0.040 inch
FRP-PMP-00001	radioactive liquid	housing, impeller: CD4MCu (J93370) or better	0.040 inch
FRP-PMP-00002A	radioactive liquid	housing, impeller: CD4MCu (J93370) or better	0.040 inch
HLP-PMP-00017A/B	radioactive slurry	316L (S31603) (max 0.030% C; dual certified); gaskets/seals: metal-graphite	0.040 inch; 0.125 inch overlay of Stellite 12 or 712
HLP-PMP-00019A/B	radioactive slurry	housing, impeller: CD4MCu (J93370) or better	0.040 inch

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
HLP-PMP-00021	radioactive slurry	housing, impeller: CD4MCu (J93370) or better	0.040 inch
PVP-PMP-00001A/B	radioactive liquid	housing, shaft, impeller, containment shell/stator liner, inner sheathing/rotor liner: 316L (S31603)	0.125 inch
PVP-PMP-00002A/B	radioactive liquid	housing, shaft, impeller, containment shell/stator liner, inner sheathing/rotor liner: 316L (S31603)	0.125 inch
PWD-PMP-00024A/B	radioactive liquid	housing, shaft, impeller, sleeve: 316L (S31603)	0.040 inch
RDP-PMP-00008A/B	spent CXP ion exchange resin	housing, impeller: 316L (S31603)	0.125 inch
RDP-PMP-00011	radioactive water	vendor package	manufacturer standard
RLD-PMP-00005A/B	radioactive liquid	housing, shaft, sleeve: 316L (S31603); impeller: CD4MCu (J93370)	0.040 inch
RLD-PMP-00011A/B	radioactive liquid	housing, impeller, sleeve: 316L (S31603); shaft: carbon steel	0.040 inch
RLD-PMP-00012A/B	radioactive liquid	housing, impeller, sleeve: 316L (S31603); shaft: carbon steel	0.040 inch
RLD-PMP-00014A/B	radioactive liquid	housing, impeller, sleeve: 316L (S31603); shaft: carbon steel	0.040 inch
TCP-PMP-00001A/B	radioactive liquid	housing, impeller: CD4MCu (J93370); shaft: 1144 steel; sleeve: Alloy 20 (N08020)	0.040 inch (includes no erosion allowance) unless a larger corrosion allowance is recommended by the design code or standard
TLP-PMP-00001	steam and cooling water	housing: 316L (S31603); impeller: ASTM A351 CN3MN (J94651); shaft: 6% molybdenum alloy (N08367); flange studs: Nitronic 60 (Alloy 218) (S21800)	0.040 inch
TLP-PMP-00002A/B	radioactive liquid	housing, impeller, sleeve: 316L (S31603); shaft: SAE 4140 (G41400) (Cr-molybdenum steel)	0.040 inch
TLP-PMP-00005A/B	radioactive liquid	housing, impeller, shaft, sleeve: 316L (S31603)	0.040 inch
TLP-PMP-00011A/B	radioactive liquid	housing, impeller, sleeve: 316L (S31603); shaft: SAE 4140 (G41400) (Cr-molybdenum steel)	0.040 inch
UFP-PMP-00041A/B	radioactive slurry	housing, impeller: CD4MCu (J93370) or better	0.040 inch

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
UFP-PMP-00042A/B UFP-PMP-00043A/B	radioactive slurry	316L (S31603) (max 0.030% C; dual certified); gaskets/seals: metal-graphite; impeller and casing: Stellite 12 (R30012), duplex material, or equivalent	0.040 inch
UFP-PMP-00044A/B	radioactive slurry	316L (S31603) (max 0.030% C; dual certified); gaskets/seals: metal-graphite; impeller and casing: Stellite 12 (R30012), duplex material, or equivalent	0.040 inch
HLW Tanks			
HDH-VSL-00001	water, possibly radioactive	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
HDH-VSL-00003	cerous nitrate, nitric acid, sodium hydroxide, hydrogen peroxide, water	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance)
HDH-VSL-00002 HDH-VSL-00004	ceric nitrate, nitric acid, water	Ti-2 (R50400)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
HFP-VSL-00001 HFP-VSL-00002 HFP-VSL-00005 HFP-VSL-00006	blended HLW slurry and glass formers	vessel: 316L (S31603) (max 0.030% C; dual certified); mixer: Ultimet, Stellite, or equivalent	0.040 inch for top (includes no erosion allowance); 0.125 inch localized protection allowance for bottom and shell
HOP-VSL-00903 HOP-VSL-00904	liquid acidic condensate	Alloy C-22 (N06022)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance); additional erosive wear allowance of at least 0.081 inch is required as localized protection for the applicable portions of the bottom head
HSH-TK-00001 HSH-TK-00002	demineralized water, nitric acid, or other suitable decontamination solutions	316L (S31603)	0.040 inch (includes no erosion allowance)

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
RLD-VSL-00007	radioactive liquid	vessel: 6% molybdenum alloy (N08367 or N08926); piping: Alloy C-22 (N06022)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance); additional erosive wear allowance of at least 0.027 inch is required as localized protection for the applicable portions of the bottom head
RLD-VSL-00008	radioactive liquid	vessel: 316L (S31603) (max 0.030% C; dual certified); piping: Alloy C-22 (N06022)	0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch erosion allowance); additional erosive wear allowance of at least 0.014 inch is required as localized protection for the applicable portions of the bottom head
RLD-VSL-00002	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
HLW Miscellaneous Units			
HMP-MLTR-00001 HMP-MLTR-00002	blended HLW slurry and glass formers	Inconel 690 (N06690)	none required; refractory corrosion rates are accounted for in the melter designs
HOP-WESP-00001 HOP-WESP-00002	HLW melter offgas (post SBS)	6% molybdenum alloy (N08367)	0.040 inch (includes no erosion allowance)
HOP-SCO-00001 HOP-SCO-00004	HLW melter offgas	316L (S31603) (max 0.030% C; dual certified)	none required
HOP-SCR-00001 HOP-SCR-00002	HLW melter offgas	316L (S31603) (max 0.030% C; dual certified)	none required
HOP-ABS-00002 HOP-ABS-00003	filtered radioactive gas	316L (S31603) (max 0.030% C; dual certified)	NA
HOP-FCLR-00001 HOP-FCLR-00002 HOP-FCLR-00003 HOP-FCLR-00004	HLW melter offgas	Inconel 690 (N06690)	NA
HOP-HEPA-00001A/B HOP-HEPA-00002A/B HOP-HEPA-00007A/B HOP-HEPA-00008A/B	HLW melter offgas	304L (S30403)	NA
HOP-HTR-00001B HOP-HTR-00002A HOP-HTR-00005A/B	HLW melter offgas	316L (S31603)	0.040 inch
HOP-HTR-00001 HOP-HTR-00007	HLW melter offgas	316L (S31603)	NA
HOP-HX-00001 HOP-HX-00003	HLW melter offgas	cold side: 316L (S31603) (max 0.030% C; dual certified) hot side: 347 (S34700)	0.010 inch

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
HOP-HX-00002 HOP-HX-00004	HLW melter offgas	316L (S31603) (max 0.030% C; dual certified)	NA
HOP-FAN-00001A/B/C HOP-FAN-00008A/B/C HOP-FAN-00009A/B/C HOP-FAN-00010A/B/C	HLW melter offgas	316L (S31603)	NA
HOP-ADBR-00001A/B HOP-ADBR-00002A/B	activated carbon for mercury abatement	316L (S31603) (max 0.030% C; dual certified)	NA
HOP-HEME-00001A/B HOP-HEME-00002A/B	radioactive mist and particulate	6% molybdenum alloy (N08367)	0.040 inch
HOP-SCB-00001 HOP-SCB-00002	radioactive liquid	Alloy C-22 (N06022); packing can be an acid resistant ceramic such as aluminum oxide or equivalent	0.080 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
PJV-HEPA-00004A/B PJV-HEPA-00005A/B	HLW melter offgas	304L (S30403)	NA
PJV-HTR-00002	HLW melter offgas	316L (S31603); plenum chamber made of 304L (S30403)	0.040 inch (includes no erosion allowance)
PJV-FAN-00002A/B	HLW melter offgas	316L (S31603)	NA
HLW Breakpots			
RLD-BRKPT-00004	radioactive liquid	304L (S30403) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
RLD-BRKPT-00007 RLD-BRKPT-00009	radioactive liquid	316L (S31603) (max 0.030% C; dual certified)	0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
HLW Sumps			
HFP-SUMP-00001 HFP-SUMP-00004 HFP-SUMP-00002 HFP-SUMP-00005	radioactive liquid	6% molybdenum alloy (N08367)	0.040 inch
HOP-SUMP-00003 HOP-SUMP-00008	radioactive liquid	6% molybdenum alloy (N08367)	0.040 inch
HSH-SUMP-00003 HSH-SUMP-00007	radioactive liquid	6% molybdenum alloy (N08367)	0.040 inch
HSH-SUMP-00008 HSH-SUMP-00009	nitric acid	6% molybdenum alloy (N08367)	0.040 inch
HDH-SUMP-00001 HDH-SUMP-00002	water, possibly radioactive	6% molybdenum alloy (N08367)	0.040 inch
HDH-SUMP-00003	cerous nitrate, ceric nitrate, nitric acid, sodium hydroxide, hydrogen peroxide, water	6% molybdenum alloy (N08367)	0.040 inch

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
RLD-SUMP-00001 HCP-SUMP-00001	radioactive liquid	6% molybdenum alloy (N08367)	0.040 inch
HPH-SUMP-00001 HPH-SUMP-00003 HPH-SUMP-00005	water, possibly radioactive	6% molybdenum alloy (N08367)	0.040 inch
HLW Piping			
Systems with less than 2% solids	liquid acidic condensate, radioactive liquid	Alloy C-22 (N06022)	0.040 inch
Systems with less than 2% solids	ceric nitrate, nitric acid, water	Ti-2 (R50400)	0.040 inch
Systems with less than 2% solids	radioactive liquid, HLW melter offgas, radioactive mist and particulate	6% molybdenum alloy (N08367/N08926)	0.040 inch
Systems with less than 2% solids	HLW melter offgas	304L (S30403)	0.040 inch
Systems with less than 2% solids	radioactive liquid, nitric acid, HLW melter offgas	316L (S31603)	0.040 inch
Systems with more than 2% solids	HLW concentrate feed	316L (S31603)	0.0937 inch
Systems with glass formers	HLW melter feed	316L (S31603)	0.125 inch
HLW Pumps			
HDH-PMP-00001	water, possibly radioactive	housing, shaft, impeller: 316L (S31603)	0.040 inch
HFP-PMP-00001 HFP-PMP-00002 HFP-PMP-00014 HFP-PMP-00015	blended HLW slurry and glass formers	vendor package	manufacturer standard
HFP-PMP-00005A/B HFP-PMP-00018A/B	blended HLW slurry and glass formers	housing, impeller, sleeve, shaft busing deflector: Stellite 12 (R30012); shaft, suction pipe, discharge pipe: Zeron 100 (S32760); mounting flange/plate, primer pipe: 316L (S31603)	0.125 inch for housing and impeller
HFP-PMP-00007 HFP-PMP-00017	blended HLW slurry and glass formers	housing, impeller, sleeve, shaft busing deflector: Stellite 12 (R30012); shaft, suction pipe, discharge pipe: Zeron 100 (S32760); mounting flange/plate, primer pipe: 316L (S31603)	0.125 inch for housing and impeller

Table 2 (cont'd) Summary of Materials of Construction and Corrosion Allowances

Plant Item Number	Contents	Materials of Construction (UNS Number)	Corrosion and Erosion Allowances[1]
HSH-PMP-00001 HSH-PMP-00002	demineralized water, nitric acid, or other suitable decontamination solutions	vendor package	manufacturer standard
RLD-PMP-00023	water, possibly radioactive	housing, body, wetted components: 316L (S31603); mountings, hardware: 304L (S30403); shaft: 416 (S41600); diaphragm, check valve, check valve seats: santoprene, polyethelene	0.040 inch
Underground Transfer Lines			
Piping	LAW and HLW feed; radioactive liquid	primary containment pipe: 316L (S31603); secondary containment pipe: carbon steel	primary containment pipe: 0.0160 to 0.0937 inch; secondary containment pipe: none required

Notes:

1 See Appendix A for list of applicable Corrosion Evaluation Reports/Material Selection Data Sheets for DWP-regulated plant items. The corrosion allowance listed includes the erosion allowance.

2 dual certified = meets the mechanical and chemical requirements of more than one type of steel; e.g., has chemical and mechanical properties complying with both Type 316 and Type 316L, or both Type 304 and Type 304L, specifications. This ensures higher strength material with the chemical composition of the low carbon levels.

Acronyms:

ASTM – American Society for Testing and Materials
C – carbon
Cr – chromium
Cs – cesium
CRP – cesium resin addition process system
CXP – cesium ion exchange process system
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NO_x - nitrogen oxides
% - percent
PJM – pulse jet mixer
PJV – pulse jet ventilation system
PTF - pretreatment facility
PVP - pretreatment vessel vent process system
SAE – Society of Automotive Engineers
SBS - submerged bed scrubber
SPC - special protective coating
Ti - titanium
UFP - ultrafiltration process system

Table 2 (cont'd) **Summary of Materials of Construction and Corrosion Allowances**

UNS - unified numbering system
VOC - volatile organic compound

Table 3 Materials of Construction Specification and Corrosion Potentials

Material	UNS Number Specification	Corrosion Potential	Applicable Plant Item Number
Metals			
Stainless steel 304L	S30403	more resistant to corrosion in nitric acid, if no chlorides are present, than 316L and less prone to stress corrosion cracking than its higher carbon version (stainless steel 304)	Piping HDH-VSL-00003 HOP-HEPA-00001A/B HOP-HEPA-00002A/B HOP-HEPA-00007A/B HOP-HEPA-00008A/B PJV-HEPA-00004A/B PJV-HEPA-00005A/B CNP-VSL-00004 CNP-VSL-00001 CXP-VSL-00004 CXP-VSL-00005 PVP-VSL-00001 RDP-VSL-00004 RLD-VSL-00017A/B TLP-VSL-00002 UFP-VSL-00002A/B CNP-HX-00002 CNP-HX-00003 CNP-HX-00004 FEP-SEP-00001A/B PJV-DMST-00002A/B/C PVP-HEME-00001A/B/C TLP-SEP-00001 PVP-CLR-00001 FEP-RBLR-00001A/B TLP-RBLR-00001 PJV-HEPA-00001A/B/C/D/E/F/G PJV-HEPA-00002A/B/C/D/E/F PVV-HEPA-00001A/B PVV-HEPA-00002A/B CNP-BRKPT-00001 CNP-BRKPT-00002 UFP-PP-00001A/B UFP-PP-00002A/B UPF-PP-00003A/B PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A PWD-SUMP-00003 PWD-SUMP-00004 PWD-SUMP-00005 PWD-SUMP-00006 PWD-SUMP-00007 PWD-SUMP-00008 PWD-SUMP-00009 PWD-SUMP-00010

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

Material	UNS Number Specification	Corrosion Potential	Applicable Plant Item Number
			PWD-SUMP-00011 PWD-SUMP-00012 PWD-SUMP-00013 PWD-SUMP-00031 PWD-SUMP-00034 PWD-SUMP-00035 PWD-SUMP-00036 RLD-PMP-00023
Stainless steel 316L	S31603	more resistant to pitting corrosion, stress corrosion cracking, and crevice corrosion than its higher carbon version (stainless steel 316)	Piping (including underground transfer lines) HDH-VSL-00001 HFP-VSL-00001 HFP-VSL-00002 HFP-VSL-00005 HFP-VSL-00006 HSH-TK-00001 HSH-TK-00002 RLD-VSL-00008 RLD-VSL-00002 HOP-SCO-00001 HOP-SCO-00004 HOP-SCR-00001 HOP-SCR-00002 HOP-ABS-00002 HOP-ABS-00003 HOP-HTR-00001B HOP-HTR-00002A HOP-HTR-00005A/B HOP-HTR-00001 HOP-HTR-00007 HOP-HX-00001 HOP-HX-00002 HOP-HX-00003 HOP-HX-00004 HOP-FAN-00001A/B/C HOP-FAN-00008A/B/C HOP-FAN-00009A/B/C HOP-FAN-00010A/B/C HOP-ADBR-00001A/B HOP-ADBR-00002A/B PJV-HTR-00002 PJV-FAN-00002A/B CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004 CXP-VSL-00001 CXP-VSL-00026A/B/C

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

Material	UNS Number Specification	Corrosion Potential	Applicable Plant Item Number
			FEP-VSL-00017A/B FEP-VSL-00005 FRP-VSL-00002A/B/C/D HLP-VSL-00028 HLP-VSL-00027A/B HLP-VSL-00022 PIH-TK-00001 PWD-VSL-00033 PWD-VSL-00043 PWD-VSL-00046 PWD-VSL-00015 PWD-VSL-00016 PWD-VSL-00044 RDP-VSL-00002A/B/C RLD-TK-00006A/B TCP-VSL-00001 UFP-VSL-00062A/B/C UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B UFP-VSL-00001A/B CNP-VSL-00003 PVP-HX-00002 FEP-COND-00001A/B FEP-COND-00002A/B FEP-COND-00003A/B PVP-ADBR-00001A/B TLP-COND-00001 TLP-COND-00002 TLP-COND-00003 PVP-SCB-00002 PVP-OXID-00001 PVP-FILT-00001 PWD-BRKPT-00007 PWD-BRKPT-00008 PWD-BRKPT-00009 PWD-BRKPT-00010 PWD-BRKPT-00015 PWD-BRKPT-00016 PWD-BRKPT-00017 PWD-BRKPT-00019 UFP-BRKPT-00001B CRP-BULGE-00001 CXP-BULGE-00004 CXP-BULGE-00006 PVP-BULGE-00001

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

Material	UNS Number Specification	Corrosion Potential	Applicable Plant Item Number
			PVP-BULGE-00002 PVP-BULGE-00014 TCP-BULGE-00004 UFP-BULGE-00001 UFP-BULGE-00002 UFP-BULGE-00005 UFP-BULGE-00006 PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029 PWD-SUMP-00032 PWD-SUMP-00033 CNP-PMP-00001 CXP-PMP-00001A/B CXP-PMP-00002A/B FEP-PMP-00006A/B FEP-PMP-00009A/B HLP-PMP-00017A/B PVP-PMP-00001A/B PVP-PMP-00002A/B PWD-PMP-00024A/B RDP-PMP-00008A/B RLD-PMP-00005A/B RLD-PMP-00011A/B RLD-PMP-00012A/B RLD-PMP-00014A/B TLP-PMP-00001 TLP-PMP-00002A/B TLP-PMP-00005A/B TLP-PMP-00011A/B UFP-PMP-00042A/B UFP-PMP-00043A/B UFP-PMP-00044A/B HDH-PMP-00001 HFP-PMP-00005A/B HFP-PMP-00007 HFP-PMP-00017 HFP-PMP-00018A/B RLD-PMP-00023
Stainless steel 347	S34700	suitable for high temperature applications where 316L is precluded and dry-air conditions are not conducive to general corrosion	HOP-HX-00001 (hot-side components) HOP-HX-00003 (hot-side components)

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

Material	UNS Number Specification	Corrosion Potential	Applicable Plant Item Number
6% molybdenum alloy	N08367 N08925 N08926	more resistant to acids and chlorides than the 300 series stainless steels	Piping RLD-VSL-00007 HOP-WESP-00001 HOP-WESP-00002 HOP-HEME-00001A/B HOP-HEME-00002A/B TLP-VSL-00009A/B CNP-DISTC-00001 PWD-SUMP-00040 HFP-SUMP-00001 HFP-SUMP-00002 HFP-SUMP-00004 HFP-SUMP-00005 HOP-SUMP-00003 HOP-SUMP-00008 HSH-SUMP-00003 HSH-SUMP-00007 HSH-SUMP-00008 HSH-SUMP-00009 HDH-SUMP-00001 HDH-SUMP-00002 HDH-SUMP-00003 RLD-SUMP-00001 HCP-SUMP-00001 HPH-SUMP-00001 HPH-SUMP-00003 HPH-SUMP-00005 FEP-PMP-00009A/B TLP-PMP-00001
Alloy C-22 or Hastelloy C-22 – Ni-Cr-molybdenum alloy	N06022	more resistant to acids and chlorides than the 300 series stainless steels or 6% molybdenum alloy	Piping HLP-BRKPT-00004 HLP-BRKPT-00006 HOP-VSL-00903 HOP-VSL-00904 HOP-SCB-00001 HOP-SCB-00002 CNP-EVAP-00001 CNP-HX-00001
Inconel 690 (Alloy 690) – Ni-Cr alloy	N06900	very resistant to attack from oxidizing chemicals or hot gases	HMP-MLTR-00001 HMP-MLTR-00002 HOP-FCLR-00001 HOP-FCLR-00002 HOP-FCLR-00003 HOP-FCLR-00004

Table 3 (cont'd) Materials of Construction Specification and Corrosion Potentials

Material	UNS Number Specification	Corrosion Potential	Applicable Plant Item Number
Titanium	R50400	more resistant to corrosion in oxidizing solutions than in non-oxidizing solutions; resistant to attack in mixtures of strong acids; generally more resistant to pitting corrosion, crevice corrosion, stress corrosion, and galvanic corrosion	Piping HDH-VSL-00002 HDH-VSL-00004
Duplex Stainless Steel (CD4MCu)	J93370	moderately high strength and hardness combined with good ductility and impact properties, resulting in an alloy with superior resistance to abrasion or erosion-corrosion; highly resistant to stress-corrosion cracking in chloride environments; highly resistant to nitric and sulfuric acids	CXP-PMP-00001A/B FEP-PMP-00007A/B FEP-PMP-00008A/B FRP-PMP-00001 FRP-PMP-00002A HLP-PMP-00019A/B HLP-PMP-00021 RLD-PMP-00005A/B TCP-PMP-00001A/B UFP-PMP-00041A/B

Acronyms:

Cr - chromium
°F - degrees Fahrenheit
Ni - nickel
% - percent
UNS - unified numbering system

Table 4 Radiological Area Classification Based on Dose Rate

Classification	Target Dose Equivalent Rate (mrem/hr) for Wide-Spread and Static Radiation Fields (Note 1)	Maximum Dose Equivalent Rate (mrem/hr) (see Notes 2 and 3)	Type of Access Control
R1 Radiological Controlled Area	0.025	0.050	General Employee Radiological Training (GERT) required to access.
R2 Radiological Buffer Area	0.250	0.500	No limit on occupancy for general employees. A TLD and Rad Worker I training required for entry.
R3 (Average Radiation Area)	See Note 1	10	Entry only to carry out prescribed tasks in accordance with normal procedures and a Radiation Work Permit. TLD and Rad Worker I training required for entry into Radiation Areas.
R4 (Maximum Radiation Area)	See Note 1	100	Entry only to carry out prescribed tasks in accordance with normal procedures and a Radiation Work Permit. TLD and Rad Worker I training required for entry into Radiation Areas.
R5 (High and Very High Radiation Area)	See Note 4	no specific limit	Normally locked. Entry is unusual and requires management approval. Supplemental dosimetry, a specific RWP, and approved procedures are also required.

Notes:

1. Occupational doses, and therefore, selection of an appropriate dose rate criterion is very sensitive to occupancy in R3, R4, and R5 areas. Hence, rather than set a specific dose rate target for any of these classifications, the appropriate value should be derived for each individual area by considering the respective contributions to the workers' annual doses and applying the ALARA principle. At early design stages, when insufficient information is available regarding worker occupancy, initial target radiation levels of 2.5 mrem/hr and 25 mrem/hr are to be used for the R3 and R4 classifications, respectively. However, these initial values should be reviewed and adjusted as appropriate, when sufficient occupancy data is available.
2. These maximum dose equivalent rate limits are set based on static whole-body radiation fields. Higher dose equivalent rates may be accepted for transient radiation fields (such as source movements), and for localized radiation fields (such as beams) that are unlikely to produce whole-body exposure, subject to an appropriate justification of the effect on annual dose and ALARA.
3. Notwithstanding the above dose rate equivalent targets and maximums, all radiation levels shall be within prescribed limits and ALARA.
4. When entry to an area that has been classified R5 is intended or anticipated by the design (frequency > 0.1[yr-1]), the design process is obligated to identify the means by which the dose rates in the affected area may be reduced to levels that are R3/R4 (less than 100 mrem/hr) prior to the entry. In any case, entry to all radiation areas is ALARA.

Acronyms:

ALARA - as low as reasonably achievable
mrem/hr - millirems per hour

Table 4 (cont'd) Radiological Area Classification Based on Dose Rate

RWP - radiological work permit
TLD - thermoluminescent dosimetry

Table 5 Radiological Area Classification Based on Contamination

Classification	Typical Type of Control (see Note 1)	Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ	Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3)	Description
C1 Radiological Controlled Area	GERT	<1,000	N/A	The C1 area means any area to which access is managed by or for DOE to protect individuals from exposure to radiation and/or radioactive material. For the WTP project, this includes all areas within the site security fence not assigned a higher radiological classification. The C1 area has low potential to be contaminated because there are no direct interfaces with contaminated areas. C1 areas are typically administrative offices, control rooms, conference rooms, locker rooms, restrooms, equipment rooms, truck bays, and non-contiguous support facilities.
C2 Radiological Buffer Area	Equipment and personnel are confirmed to be uncontaminated before exit to the uncontrolled C1 area is permitted. C2 areas may not be ventilated directly to the atmosphere. A TLD and Rad Worker I training are required for entry.	<1,000	N/A	C2 areas are operating areas of the process buildings. C2 areas have direct interfaces with contaminated areas, and have the potential to be contaminated. C2 contamination surveys are performed regularly with frequencies as determined by facility trends.
C3 Contamination Area	Work in a contaminated area requires protective clothing, a single set of coveralls, canvas booties, rubber shoe covers, appropriate gloves, and head covering. A TLD and Radworker II training are both required for entry. Respiratory protection may, on occasion, be required for specific tasks, but would not normally exceed the requirements for a full-face	≥ 1,000 but <100,000	< 40 DAC - hr year	C3 areas are the process areas where the potential for direct contact with radioactive material, contaminated systems and components, or both, exists. These areas include the following:

Table 5 (cont'd) Radiological Area Classification Based on Contamination

Classification	Typical Type of Control (see Note 1)	Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ	Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3)	Description
	particulate respirator. The interface between a contamination area and the surrounding buffer area is typically a physical barrier; however, there will be maintenance evolutions requiring the temporary posting of contamination areas without the presence of a physical barrier (e.g., areas surrounding filter housings during filter changeout).			• maintenance shops • laboratory fume hoods • Cask handling areas • sampling suites • Contact areas where breaking of containment is possible
C4 High Contamination Area (Note 4)	Work in high contamination areas may require a double set of protective clothing and a multiple step-off pad exit configuration. Table 3-1 of 24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual*, provides guidelines for selecting protective clothing and indicates double sets of protective clothing are selected based on the contamination level in the work area, the anticipated work activity, worker health considerations, and regard for nonradiological hazards that may be present. As indicated in Table 3-1, routine work in high contamination areas may not warrant a double set of protective clothing. Respiratory protection may be required on occasion for specific tasks, but would not normally exceed the requirements for a full-face particulate respirator. High contamination areas should be controlled through use of physical barriers, engineering controls, and/or containment devices, as appropriate, in accordance with Article 337 of 24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual.*	≥ 100,000 but < ≈ 500,000	> 40 DAC-hr year but < 12 DAC-hr week or < 1 DAC	C4 areas are highly contaminated as a result of the breaching large, highly contaminated systems or components when use of a glove bag is impractical.

Table 5 (cont'd) Radiological Area Classification Based on Contamination

Classification	Typical Type of Control (see Note 1)	Surface Contamination Limit (dpm/100 cm2) (see Note 2) β/γ	Mean Airborne Contamination (Fraction of Exposure Standard; see Note 3)	Description
C5 Airborne Radioactivity Area	Access to C5 areas is not normally permitted. When access is required, protective clothing for these areas includes high-integrity clothing (plastic suit), and supplied air respirators. Exiting into a contaminated area (C5 → C4, C3) requires removing the outer layer of protective clothing. ARAs are normally accessed through a permanent or temporary containment structure (tent) provided with its own filtered exhaust. Because entry to an ARA requires the use of respirators, no personnel may perform routine or periodic work within an ARA.	≥ ≈ 500,000	>12 DAC-hr week or > 1 DAC	C5 areas are highly contaminated areas that require total enclosure to ensure contamination control.

Notes:

1. The type of control listed in this column is subject to local variation and is defined by 24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual*, and specified on the RWP. Control regimes shown are expected to be typical.
2. Values shown are for β/γ contamination only. Additional, radionuclide specific limits are provided in Appendix D to 10 CFR 835, Occupational Radiation Protection.
3. Exposure standards are those of Safety Criterion 2.0-1 of 24590-WTP-SRD-ESH-01-001-02 to the worker for normal events. The breathing zone levels of airborne contamination are order-of-magnitude estimates of long-term requirements. Maximum transient values of airborne contamination may be higher.
4. Use of additional controls and respiratory protection must be evaluated when working in areas or on equipment with removable contamination levels greater than 100,000 dpm/100 cm^2.

Acronyms:

ALARA - as low as reasonably achievable
ARA - Airborne Radioactivity Area

Table 5 (cont'd) Radiological Area Classification Based on Contamination

β - beta
CFR – Code of Federal Regulations
cm - centimeter
DAC - derived air concentration
DOE – United States Department of Energy
dpm – disintegrations per minute
γ - gamma
GERT - General Employee Radiological Training
hr - hour
mrem/hr - millirems per hour
N/A – not applicable
RWP - radiological work permit
TLD - thermoluminescent dosimetry
WTP - Hanford Tank Waste Treatment and Immobilization Plant

Table 6 Summary of Radiological Area Classifications

Plant Item Name	Plant Item Number	Radiological Area Classification[1]
PTF Tanks		
Cesium Evaporator Eluant Lute Pot	CNP-VSL-00001	R5/C5 (in black cell)
Eluate Contingency Storage Vessel	CNP-VSL-00003	R5/C5 (in black cell)
Cesium Evaporator Recovered Nitric Acid Vessel	CNP-VSL-00004	R5/C5 (in black cell)
Cesium Ion Exchange Columns	CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004	R5/C5 (in hot cell)
Cesium Ion Exchange Feed Vessel	CXP-VSL-00001	R5/C5 (in black cell)
Ion Exchange Caustic Rinse Collection Vessel	CXP-VSL-00004	R5/C5 (in black cell)
Cesium Ion Exchange Reagent Vessel	CXP-VSL-00005	R5/C5 (in black cell)
Ion Exchange Treated LAW Collection Vessels	CXP-VSL-00026A/B/C	R5/C5 (in black cell)
Waste Feed Evaporator Feed Vessels	FEP-VSL-00017A/B	R5/C5 (in black cell)
Waste Feed Evaporator Condensate Vessel	FEP-VSL-00005	R3/C3
Waste Feed Receipt Vessels	FRP-VSL-00002A/B/C/D	R5/C5 (in black cell)
HLW Feed Blend Vessel	HLP-VSL-00028	R5/C5 (in black cell)
HLW Lag Storage Vessels	HLP-VSL-00027A/B	R5/C5 (in black cell)
HLW Feed Receipt Vessel	HLP-VSL-00022	R5/C5 (in black cell)
Decontamination Soak Tank	PIH-TK-00001	R5/C5
Vessel Ventilation HEME Drain Collection Vessel	PVP-VSL-00001	R5/C5 (in black cell)
Ultimate Overflow Vessel	PWD-VSL-00033	R5/C5 (in hard-to-reach area)
HLW Effluent Transfer Vessel	PWD-VSL-00043	R5/C5 (in hard-to-reach area)
C3 Floor Drain Collection Vessel	PWD-VSL-00046	R3/C3
Acidic/Alkaline Effluent Vessels	PWD-VSL-00015 PWD-VSL-00016	R5/C5 (in black cell)
Plant Wash Vessel	PWD-VSL-00044	R5/C5 (in black cell)
Spent Resin Slurry Vessels	RDP-VSL-00002A/B/C	R5/C5 (in black cell)
Spent Resin Dewatering Moisture Sep. Vessel	RDP-VSL-00004	R3/R5/C3/C5
Process Condensate Tanks	RLD-TK-00006A/B	R2/C2
Alkaline Effluent Vessels	RLD-VSL-00017A/B	R3/C3
Treated LAW Concentrate Storage Vessel	TCP-VSL-00001	R5/C5 (in black cell)
Treated LAW Evaporator Condensate Vessel	TLP-VSL-00002	R3/C3
LAW SBS Condensate Receipt Vessels	TLP-VSL-00009A/B	R5/C5 (in black cell)
Ultrafilter Permeate Vessels	UFP-VSL-00062A/B/C	R5/C5 (in black cell)
Ultrafiltration Feed Preparation Vessels	UFP-VSL-00001A/B	R5/C5 (in black cell)
Ultrafiltration Feed Vessels	UFP-VSL-00002A/B	R5/C5 (in black cell)
Ultrafilters	UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B	R5/C5 (in hot cell)
PTF Miscellaneous Units		
Cesium Evaporator Separator Vessel	CNP-EVAP-00001	R5/C5 (in black cell)
Cesium Evaporator Concentrate Reboiler	CNP-HX-00001	R5/C5
Cesium Nitric Acid Rectifier	CNP-DISTC-00001	R3/C3

Table 6 (cont'd) Summary of Radiological Area Classifications

Plant Item Name	Plant Item Number	Radiological Area Classification[1]
Cesium Evaporator Primary Condenser	CNP-HX-00002	R3/C3
Cesium Evaporator Intercondenser	CNP-HX-00003	R3/C3
Cesium Evaporator Aftercondenser	CNP-HX-00004	R3/C3
Waste Feed Evaporator Separator Vessels	FEP-SEP-00001A/B	R5/C5 (in black cell)
Waste Feed Evaporator Reboilers	FEP-RBLR-00001A/B	R5/C5
Waste Feed Evaporator Primary Condensers	FEP-COND-00001A/B	R3/C3
Waste Feed Evaporator Intercondensers	FEP-COND-00002A/B	R3/C3
Waste Feed Evaporator Aftercondensers	FEP-COND-00003A/B	R3/C3
PJV Primary Exhaust HEPA Filters	PJV-HEPA-00001A/B/C/D/E/F/G	R5/C5
PJV Secondary Exhaust HEPA Filters	PJV-HEPA-00002A/B/C/D/E/F	R2/C3
PJV Exhaust Fans	PJV-FAN-00001A/B/C	R2/C2
PJV Demisters	PJV-DMST-00002A/B/C	R5/C5
Carbon Bed Adsorbers	PVP-ADBR-00001A/B	R2/C2
After Cooler	PVP-CLR-00001	R2/C2
VOC Oxidizer Unit	PVP-OXID-00001	R2/C2
Adsorber Outlet Filter	PVP-FILT-00001	R2/C2
HEME Filters	PVP-HEME-00001A/B/C	R5/C5
Scrubbing Liquid Cooler	PVP-HX-00002	R2/C3
Caustic Scrubber	PVP-SCB-00002	R5/C5 (in black cell)
Primary HEPA Filters	PVV-HEPA-00001A/B	R5/C5
Secondary HEPA Filters	PVV-HEPA-00002A/B	R5/C5
Exhaust Fans	PVV-FAN-00001A/B	R2/C2
Treated LAW Evaporator Separator Vessel	TLP-SEP-00001	R5/C5 (in black cell)
Treated LAW Evaporator Reboiler	TLP-RBLR-00001	R5/C5
Treated LAW Evap. Primary Condenser	TLP-COND-00001	R3/C3
Treated LAW Evaporator Intercondenser	TLP-COND-00002	R3/C3
Treated LAW Evaporator Aftercondenser	TLP-COND-00003	R3/C3
PTF Breakpots and Pulsepots		
Cesium Concentrate Breakpot	CNP-BRKPT-00001	R5/C5 (in black cell)
Cesium Evaporator Eluate Breakpot	CNP-BRKPT-00002	R5/C5 (in black cell)
Cesium Concentrate Receipt Breakpots	HLP-BRKPT-00004 HLP-BRKPT-00006	R5/C5 (in black cell)
Plant Wash Breakpots	PWD-BRKPT-00007 PWD-BRKPT-00008 PWD-BRKPT-00009 PWD-BRKPT-00010 PWD-BRKPT-00017 PWD-BRKPT-00019	R5/C5 (in black cell)
Acidic/Alkaline Effluent Breakpots	PWD-BRKPT-00015 PWD-BRKPT-00016	R5/C5 (in black cell)
Ultrafiltration Recycle Breakpot	UFP-BRKPT-00001B	R5/C5 (in black cell)

Table 6 (cont'd) Summary of Radiological Area Classifications

Plant Item Name	Plant Item Number	Radiological Area Classification[1]
Ultrafiltration Pulsepots	UFP-PP-00001A/B UFP-PP-00002A/B UFP-PP-00003A/B	R5/C5 (in hot cell)
PTF Bulges and Sumps		
Cesium Resin Addition Bulge	CRP-BULGE-00001	R3/C3
Cesium IX Process Bulge	CXP-BULGE-00004	R3/C3
Vessel Vent Caustic Scrubber Transfer Pump Bulge	PVP-BULGE-00001	R3/C3
Vessel Vent HEME Drain Vessel Pump Bulge	PVP-BULGE-00002	R3/C3
Vessel Vent Heat Exchanger Bulge	PVP-BULGE-00014	R3/C3
Process Bulge	TCP-BULGE-00004	R3/C3
Ultrafiltration Reagent Bulges	UFP-BULGE-00001 UFP-BULGE-00002	R3/C3
Ultrafiltration Utility Bulges	UFP-BULGE-00005 UFP-BULGE-00006	R3/C3
Black Cell Sumps	PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A PWD-SUMP-00003 PWD-SUMP-00004 PWD-SUMP-00005 PWD-SUMP-00006 PWD-SUMP-00007 PWD-SUMP-00008 PWD-SUMP-00009 PWD-SUMP-00010 PWD-SUMP-00011 PWD-SUMP-00012 PWD-SUMP-00013	R5/C5
Hot Cell and Maintenance Cave Sumps	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029 PWD-SUMP-00032 PWD-SUMP-00033	R5/C5
Other PWD Sumps	PWD-SUMP-00034 PWD-SUMP-00035	R3/C3/R5/C5
Alkaline Effluent Collection Area Sump	PWD-SUMP-00036	R3/C3
-45-ft Pit Sump	PWD-SUMP-00040	R5/C5 (in hard-to-reach area)
C2/C3 Drains Pit Sump	PWD-SUMP-00071	R3/C3
RLD Containment Area Sump	RLD-SUMP-00003	none
PTF Pumps		
Cesium Nitric Acid Recovery Process Recirculation Pump	CNP-PMP-00001	R5/C5
Process Condensate Return Pump	CNP-PMP-00002	R3/C3
Cesium Ion Exchange Feed Pumps	CXP-PMP-00001A/B	R5/C5
Treated LAW Feed Pumps	CXP-PMP-00002A/B	R3/C3

Table 6 (cont'd) Summary of Radiological Area Classifications

Plant Item Name	Plant Item Number	Radiological Area Classification[1]
Waste Feed Evaporator Process Condensate Pumps	FEP-PMP-00006A/B	R3/C3
Waste Feed Evaporator Feed Pumps	FEP-PMP-00007A/B	R5/C5
Waste Feed Evaporator Concentrate Pumps	FEP-PMP-00008A/B	R5/C5
Waste Feed Evaporator System Recirculation Pumps	FEP-PMP-00009A/B	R5/C5
Waste Feed Return Pump	FRP-PMP-00001	R5/C5
Waste Feed Transfer Pump	FRP-PMP-00002A	R5/C5
HLW Solids Transfer Pumps	HLP-PMP-00017A/B	R5/C5
HLW Melter Feed Pumps	HLP-PMP-00019A/B	R5/C5
HLW Feed Receipt Transfer Pump	HLP-PMP-00021	R5/C5
Vessel Vent Scrubber Recirculating Pumps	PVP-PMP-00001A/B	R3/C3
HEME Drain Collection Vessel Pumps	PVP-PMP-00002A/B	R3/C3
C3 Area Floor Drains Transfer Pumps	PWD-PMP-00024A/B	R3/C3
Spent Resin Slurry Pumps	RDP-PMP-00008A/B	R5/C5
Spent Resin Dewatering Pump	RDP-PMP-00011	R3/R5/C3/C5
Alkaline Effluent Pumps	RLD-PMP-00005A/B	R3/C3
Process Condensate Pumps	RLD-PMP-00011A/B	R2/C2
Process Condensate Recirculation Pumps	RLD-PMP-00012A/B	R2/C2
Process Condensate Distribution Pumps	RLD-PMP-00014A/B	R2/C2
Treated LAW Concentrate Transfer Pumps	TCP-PMP-00001A/B	R3/C3
Treated LAW Evaporator System Recirculation Pump	TLP-PMP-00001	R5/C5
Treated LAW Evaporator Process Condensate Pumps	TLP-PMP-00002A/B	R3/C3
Treated LAW Evaporator System Feed Pumps	TLP-PMP-00005A/B	R3/C3
Treated LAW Evaporator System Concentrate Pumps	TLP-PMP-00011A/B	R3/C3
Concentrate Transfer Pumps	UFP-PMP-00041A/B	R5/C5
Ultrafiltration Recirculation Pumps	UFP-PMP-00042A/B UFP-PMP-00043A/B	R5/C5
Progressive Cavity Pumps	UFP-PMP-00044A/B	R5/C5
HLW Tanks		
Rinse Tunnel Canister Rinse Vessel	HDH-VSL-00001	R3/R5/C3/C5
Waste Neutralization Vessel	HDH-VSL-00003	R3/R5/C3/C5
Canister Decon Vessel 1	HDH-VSL-00002	R3/R5/C3/C5
Canister Decon Vessel 2	HDH-VSL-00004	R3/R5/C3/C5
Melter 1 Feed Preparation Vessel	HFP-VSL-00001	R5/C5 (in hot cell)
Melter 1 Feed Vessel	HFP-VSL-00002	R5/C5 (in hot cell)
Melter 2 Feed Preparation Vessel	HFP-VSL-00005	R5/C5 (in hot cell)
Melter 2 Feed Vessel	HFP-VSL-00006	R5/C5 (in hot cell)
SBS Condensate Receiver Vessel No. 1	HOP-VSL-00903	R5/C5 (in black cell)
SBS Condensate Receiver Vessel No. 2	HOP-VSL-00904	R5/C5 (in black cell)
Decontamination Tank Melter Cave 1	HSH-TK-00001	R5/C5
Decontamination Tank Melter Cave 2	HSH-TK-00002	R5/C5
Acidic Waste Vessel	RLD-VSL-00007	R5/C5 (in black cell)

Table 6 (cont'd) Summary of Radiological Area Classifications

Plant Item Name	Plant Item Number	Radiological Area Classification[1]
Plant Wash and Drains Vessel	RLD-VSL-00008	R5/C5 (in black cell)
Offgas Drains Collection Vessel	RLD-VSL-00002	R5/C5 (in black cell)
HLW Miscellaneous Units		
Melter 1	HMP-MLTR-00001	R5/C5 (in hot cell)
Melter 2	HMP-MLTR-00002	R5/C5 (in hot cell)
Wet Electrostatic Precipitators	HOP-WESP-00001 HOP-WESP-00002	R5/C5 (in hard-to-reach area)
Thermal Catalytic Oxidizers	HOP-SCO-00001 HOP-SCO-00004	R3/C2/C3
NO_x Selective Catalytic Reducers	HOP-SCR-00001 HOP-SCR-00002	R3/C2/C3
Silver Mordenite Columns	HOP-ABS-00002 HOP-ABS-00003	R2/C2
Film Coolers	HOP-FCLR-00001 HOP-FCLR-00002 HOP-FCLR-00003 HOP-FCLR-00004	R5/C5 (in hot cell)
HEPA Filters	HOP-HEPA-00001A/B HOP-HEPA-00002A/B HOP-HEPA-00007A/B HOP-HEPA-00008A/B	R5/C5 (in hot cell)
HEPA Electric Preheaters	HOP-HTR-00001B HOP-HTR-00002A	R5/C5 (in hot cell)
HEPA Electric Preheaters, Melter 2	HOP-HTR-00005A/B	R5/C5 (in hot cell)
Catalyst Skid Electric Heaters	HOP-HTR-00001 HOP-HTR-00007	R3/C2/C3
Catalyst Skid Preheaters	HOP-HX-00001 HOP-HX-00003	R3/C2/C3
Silver Mordenite Preheaters	HOP-HX-00002 HOP-HX-00004	R3/C2/C3
Booster Extraction Fans	HOP-FAN-00001A/B/C HOP-FAN-00009A/B/C	R2/C2
Stack Extraction Fans	HOP-FAN-00008A/B/C HOP-FAN-00010A/B/C	R2/C2/C3
Activated Carbon Adsorbers	HOP-ADBR-00001A/B HOP-ADBR-00002A/B	R3/C2/C3
HEMEs	HOP-HEME-00001A/B HOP-HEME-00002A/B	R5/C5 (in hot cell)
Submerged Bed Scrubbers	HOP-SCB-00001 HOP-SCB-00002	R5/C5 (in hot cell)
HEPA Filters	PJV-HEPA-00004A/B PJV-HEPA-00005A/B	R5/C5
Electric Heater	PJV-HTR-00002	R5/C5

Table 6 (cont'd) Summary of Radiological Area Classifications

Plant Item Name	Plant Item Number	Radiological Area Classification[1]
Pulse Jet Fans	PJV-FAN-00002A/B	R2/C2/C3
HLW Breakpots		
Plant Wash and Drains Vessel Transfer Breakpot	RLD-BRKPT-00004	R5/C5 (in black cell)
Acidic Waste Vessel Transfer Breakpots	RLD-BRKPT-00007 RLD-BRKPT-00009	R5/C5 (in black cell)
HLW Sumps		
Active Services Cell Melter Sumps	HFP-SUMP-00001 HFP-SUMP-00004	R5/C5 (in hard-to-reach area)
Melter Cave Sumps	HFP-SUMP-00002 HFP-SUMP-00005	R5/C5 (in hot cell)
SBS Drain Collection Cell Sumps	HOP-SUMP-00003 HOP-SUMP-00008	R5/C5 (in black cell)
Melter Cave Sumps	HSH-SUMP-00003 HSH-SUMP-00007	R5/C5 (in hot cell)
Decontamination Tank Melter Cave Sumps	HSH-SUMP-00008 HSH-SUMP-00009	R5/C5
Canister Rinse Tunnel Sump	HDH-SUMP-00001	R3/R5/C3/C5
Canister Rinse Bogie Maintenance Room Sump	HDH-SUMP-00002	R3/C3
Canister Decontamination Cave Sump	HDH-SUMP-00003	R3/R5/C3/C5
Wet Process Cell Sumps	RLD-SUMP-00001 HCP-SUMP-00001	R5/C5 (in black cell)
Canister Handling Cave Sumps	HPH-SUMP-00001 HPH-SUMP-00003 HPH-SUMP-00005	R5/C5
HLW Pumps		
Canister Rinse Bogie Pump	HDH-PMP-00001	R3/R5/C3/C5
Feed Air Displacement Slurry Pumps	HFP-PMP-00001 HFP-PMP-00002 HFP-PMP-00014 HFP-PMP-00015	R5/C5 (in hot cell)
Melters 1 and 2 Feed Preparation Vessels Sample/Transfer Pumps	HFP-PMP-00005A/B HFP-PMP-00018A/B	R5/C5 (in hot cell)
Melters 1 and 2 Feed Vessels Sample/Recirculation Pumps	HFP-PMP-00007 HFP-PMP-00017	R5/C5 (in hot cell)
Decontamination Tank Recirculation Pumps	HSH-PMP-00001 HSH-PMP-00002	R5/C5
Bogie Decon Room Sump Pump	RLD-PMP-00023	R3/C3

Note:

[1] Regulated plant items are accessible except for plant items located in hard-to-reach areas or black cells.

Acronyms:

HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
LAW – low-activity waste

Table 6 (cont'd) Summary of Radiological Area Classifications

NO_x - nitrogen oxides
PJV – pulse jet ventilation system
PTF - pretreatment facility
SBS - submerged bed scrubber
UNS - unified numbering system
VOC - volatile organic compound

Table 7 Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
PTF Tanks				
Cesium Evaporator Eluant Lute Pot	CNP-VSL-00001	X		Located in a black cell. 10 years[3]
Eluate Contingency Storage Vessel	CNP-VSL-00003		X	Located in a black cell. 7 years[2]
Cesium Evaporator Recovered Nitric Acid Vessel	CNP-VSL-00004	X		Located in a black cell. 10 years[3]
Cesium Ion Exchange Columns	CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004	X		10 years[3]; designed for remote removal and replacement after a 10-year design life.
Cesium Ion Exchange Feed Vessel	CXP-VSL-00001	X		Located in a black cell. 10 years[3]
Ion Exchange Caustic Rinse Collection Vessel	CXP-VSL-00004	X		Located in a black cell. 10 years[3]
Cesium Ion Exchange Reagent Vessel	CXP-VSL-00005	X		Located in a black cell. 10 years[3]
Ion Exchange Treated LAW Collection Vessels	CXP-VSL-00026A/B/C	X		Located in a black cell. 10 years[3]
Waste Feed Evaporator Feed Vessels	FEP-VSL-00017A/B		X	Located in a black cell. 7 years[2]
Waste Feed Evaporator Condensate Vessel	FEP-VSL-00005	X		10 years[3]
Waste Feed Receipt Vessels	FRP-VSL-00002A/B/C/D		X	Located in a black cell. 7 years[2]
HLW Feed Blend Vessel	HLP-VSL-00028		X	Located in a black cell. 7 years[2]
HLW Lag Storage Vessels	HLP-VSL-00027A/B		X	Located in a black cell. 7 years[2]
HLW Feed Receipt Vessel	HLP-VSL-00022		X	Located in a black cell. 7 years[2]
Decontamination Soak Tank	PIH-TK-00001	X		10 years[3]
Vessel Ventilation HEME Drain Collection Vessel	PVP-VSL-00001	X		Located in a black cell. 10 years[3]
Ultimate Overflow Vessel	PWD-VSL-00033		X	7 years[2]
HLW Effluent Transfer Vessel	PWD-VSL-00043	X		10 years[3]
C3 Floor Drain Collection Vessel	PWD-VSL-00046	X		10 years[3]
Acidic/Alkaline Effluent Vessels	PWD-VSL-00015 PWD-VSL-00016		X	Located in a black cell. 7 years[2]
Plant Wash Vessel	PWD-VSL-00044		X	Located in a black cell. 7 years[2]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
Spent Resin Slurry Vessels	RDP-VSL-00002A/B/C		X	Located in a black cell. 7 years[2]
Spent Resin Dewatering Moisture Sep. Vessel	RDP-VSL-00004		X	7 years[2,4]
Process Condensate Tanks	RLD-TK-00006A/B	X		10 years[3]
Alkaline Effluent Vessels	RLD-VSL-00017A/B	X		10 years[3]
Treated LAW Concentrate Storage Vessel	TCP-VSL-00001		X	Located in a black cell. 7 years[2]
Treated LAW Evaporator Condensate Vessel	TLP-VSL-00002	X		10 years[3]
LAW SBS Condensate Receipt Vessels	TLP-VSL-00009A/B		X	Located in a black cell. 7 years[2]
Ultrafilter Permeate Vessels	UFP-VSL-00062A/B/C	X		Located in a black cell. 10 years[3]
Ultrafiltration Feed Preparation Vessels	UFP-VSL-00001A/B		X	Located in a black cell. 7 years[2]
Ultrafiltration Feed Vessels	UFP-VSL-00002A/B		X	Located in a black cell. 7 years[2]
Ultrafilters	UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B	X		10 years[3]
PTF Miscellaneous Units				
Cesium Evaporator Separator Vessel	CNP-EVAP-00001	X		Located in a black cell. 10 years[3]
Cesium Evaporator Concentrate Reboiler	CNP-HX-00001	X		10 years[3]
Cesium Nitric Acid Rectifier	CNP-DISTC-00001	X		10 years[3]
Cesium Evaporator Primary Condenser	CNP-HX-00002	X		10 years[3]
Cesium Evaporator Intercondenser	CNP-HX-00003	X		10 years[3]
Cesium Evaporator Aftercondenser	CNP-HX-00004	X		10 years[3]
Waste Feed Evaporator Separator Vessels	FEP-SEP-00001A/B	X		Located in a black cell. 10 years[3]
Waste Feed Evaporator Reboilers	FEP-RBLR-00001A/B	X		10 years[3]
Waste Feed Evaporator Primary Condensers	FEP-COND-00001A/B	X		10 years[3]
Waste Feed Evaporator Intercondensers	FEP-COND-00002A/B	X		10 years[3]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
Waste Feed Evaporator Aftercondensers	FEP-COND-00003A/B	X		10 years[3]
PJV Primary Exhaust HEPA Filters	PJV-HEPA-00001A/B/C/D/E/F/G	X		HEPA filters to be replaced when needed; Housing: 10 years[3]
PJV Secondary Exhaust HEPA Filters	PJV-HEPA-00002A/B/C/D/E/F	X		HEPA filters to be replaced when needed; Housing: 10 years[3]
PJV Exhaust Fans	PJV-FAN-00001A/B/C	X		10 years[3]
PJV Demisters	PJV-DMST-00002A/B/C	X		10 years[3]
Carbon Bed Adsorbers	PVP-ADBR-00001A/B	X		10 years[3]
After Cooler	PVP-CLR-00001	X		10 years[3]
VOC Oxidizer Unit	PVP-OXID-00001	X		10 years[3]
Adsorber Outlet Filter	PVP-FILT-00001	X		Filters to be replaced when needed; Housing: 10 years[3]
HEME Filters	PVP-HEME-00001A/B/C	X		HEME filters to be replaced when needed; Housing: 10 years[3]
Scrubbing Liquid Cooler	PVP-HX-00002	X		10 years[3]
Caustic Scrubber	PVP-SCB-00002	X		Located in a black cell. 10 years[3]
Primary HEPA Filters	PVV-HEPA-00001A/B	X		HEPA filters to be replaced when needed; Housing: 10 years[3]
Secondary HEPA Filters	PVV-HEPA-00002A/B	X		HEPA filters to be replaced when needed; Housing: 10 years[3]
Exhaust Fans	PVV-FAN-00001A/B	X		10 years[3]
Treated LAW Evaporator Separator Vessel	TLP-SEP-00001	X		Located in a black cell. 10 years[3]
Treated LAW Evaporator Reboiler	TLP-RBLR-00001	X		10 years[3]
Treated LAW Evaporator Primary Condenser	TLP-COND-00001	X		10 years[3]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
Treated LAW Evaporator Intercondenser	TLP-COND-00002	X		10 years[3]
Treated LAW Evaporator Aftercondenser	TLP-COND-00003	X		10 years[3]
PTF Breakpots and Pulsepots				
Cesium Concentrate Breakpot	CNP-BRKPT-00001	X		Located in a black cell. 10 years[3]
Cesium Evaporator Eluate Breakpot	CNP-BRKPT-00002	X		Located in a black cell. 10 years[3]
Cesium Concentrate Receipt Breakpots	HLP-BRKPT-00004 HLP-BRKPT-00006	X		Located in a black cell. 10 years[3]
Plant Wash Breakpots	PWD-BRKPT-00007 PWD-BRKPT-00008 PWD-BRKPT-00009 PWD-BRKPT-00010 PWD-BRKPT-00017 PWD-BRKPT-00019	X		Located in a black cell. 10 years[3]
Acidic/Alkaline Effluent Breakpots	PWD-BRKPT-00015 PWD-BRKPT-00016	X		Located in a black cell: 10 years[3]
Ultrafiltration Recycle Breakpot	UFP-BRKPT-00001B	X		Located in a black cell: 10 years[3]
Ultrafiltration Pulsepots	UFP-PP-00001A/B UFP-PP-00002A/B UFP-PP-00003A/B	X		10 years[3]
PTF Bulges				
Cesium Resin Addition Bulge	CRP-BULGE-00001		X	7 years[2]
Cesium IX Process Bulge	CXP-BULGE-00004		X	7 years[2]
Vessel Vent Caustic Scrubber Transfer Pump Bulge	PVP-BULGE-00001	X		10 years[3]
Vessel Vent HEME Drain Vessel Pump Bulge	PVP-BULGE-00002	X		10 years[3]
Vessel Vent Heat Exchanger Bulge	PVP-BULGE-00014	X		10 years[3]
High Point Vent Bulges	PVP-BULGE-00019 PVP-BULGE-00020 PVP-BULGE-00021 DIW-BULGE-00001 DIW-BULGE-00002	X		10 years[3]
Process Bulge	TCP-BULGE-00004		X	7 years[2]
Ultrafiltration Reagent Bulges	UFP-BULGE-00001 UFP-BULGE-00002		X	7 years[2]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
Ultrafiltration Utility Bulges	UFP-BULGE-00005 UFP-BULGE-00006		X	7 years[2]
PTF Sumps				
Black Cell Sumps	PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A PWD-SUMP-00003 PWD-SUMP-00004 PWD-SUMP-00005 PWD-SUMP-00006 PWD-SUMP-00007 PWD-SUMP-00008 PWD-SUMP-00009 PWD-SUMP-00010 PWD-SUMP-00011 PWD-SUMP-00012 PWD-SUMP-00013		X	Located in a black cell. 7 years[2]
Hot Cell Sumps	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029		X	7 years[2]
Maintenance Cave Sumps	PWD-SUMP-00032 PWD-SUMP-00033	X		10 years[3]
Other PWD Sumps	PWD-SUMP-00034 PWD-SUMP-00035	X		10 years[3]
Alkaline Effluent Collection Area Sump	PWD-SUMP-00036		X	7 years[2,4]
-45-ft Pit Sump	PWD-SUMP-00040		X	7 years[2]
C2/C3 Drains Pit Sump	PWD-SUMP-00071	X		10 years[3]
RLD Containment Area Sump	RLD-SUMP-00003	X		10 years[3]
HLW Tanks				
Rinse Tunnel Canister Rinse Vessel	HDH-VSL-00001	X		10 years[3]
Waste Neutralization Vessel	HDH-VSL-00003	X		10 years[3]
Canister Decon Vessel 1	HDH-VSL-00002	X		10 years[3]
Canister Decon Vessel 2	HDH-VSL-00004	X		10 years[3]
Melter 1 Feed Preparation Vessel	HFP-VSL-00001		X	7 years[2]
Melter 1 Feed Vessel	HFP-VSL-00002		X	7 years[2]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
Melter 2 Feed Preparation Vessel	HFP-VSL-00005		X	7 years[2]
Melter 2 Feed Vessel	HFP-VSL-00006		X	7 years[2]
SBS Condensate Receiver Vessel No. 1	HOP-VSL-00903		X	Located in a black cell. 7 years[2]
SBS Condensate Receiver Vessel No. 2	HOP-VSL-00904		X	Located in a black cell. 7 years[2]
Decontamination Tank Melter Cave 1	HSH-TK-00001	X		10 years[3]
Decontamination Tank Melter Cave 2	HSH-TK-00002	X		10 years[3]
Acidic Waste Vessel	RLD-VSL-00007		X	Located in a black cell. 7 years[2]
Plant Wash and Drains Vessel	RLD-VSL-00008		X	Located in a black cell. 7 years[2]
Offgas Drains Collection Vessel	RLD-VSL-00002	X		Located in a black cell. 10 years[3]
HLW Miscellaneous Units				
Melter 1	HMP-MLTR-00001	NA	NA	NA[5]
Melter 2	HMP-MLTR-00002	NA	NA	NA[5]
Wet Electrostatic Precipitators	HOP-WESP-00001 HOP-WESP-00002	X		Located in a hard-to-reach area. 10 years[3]
Thermal Catalytic Oxidizers	HOP-SCO-00001 HOP-SCO-00004	X		2 to 4-year design life for catalysts; Housing: 10 years[3]
NO_x Selective Catalytic Reducers	HOP-SCR-00001 HOP-SCR-00002	X		2 to 4-year design life for catalysts; Housing: 10 years[3]
Silver Mordenite Columns	HOP-ABS-00002 HOP-ABS-00003	X		5-year design life for silver mordenite cartridges; Housing: 10 years[3]
Film Coolers	HOP-FCLR-00001 HOP-FCLR-00002 HOP-FCLR-00003 HOP-FCLR-00004	NA	NA	NA[5]
HEPA Filters	HOP-HEPA-00001A/B HOP-HEPA-00002A/B HOP-HEPA-00007A/B HOP-HEPA-00008A/B	X		HEPA filters to be replaced when needed; Housing: 10 years[3]
HEPA Electric Preheaters	HOP-HTR-00001B HOP-HTR-00002A	X		10 years[3]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
HEPA Electric Preheaters, Melter 2	HOP-HTR-00005A/B	X		10 years[3]
Catalyst Skid Electric Heaters	HOP-HTR-00001 HOP-HTR-00007	X		10 years[3]
Catalyst Skid Preheaters	HOP-HX-00001 HOP-HX-00003	X		10 years[3]
Silver Mordenite Preheaters	HOP-HX-00002 HOP-HX-00004	X		10 years[3]
Booster Extraction Fans	HOP-FAN-00001A/B/C HOP-FAN-00009A/B/C	X		10 years[3]
Stack Extraction Fans	HOP-FAN-00008A/B/C HOP-FAN-00010A/B/C	X		10 years[3]
Activated Carbon Adsorbers	HOP-ADBR-00001A/B HOP-ADBR-00002A/B	X		1-year design life for activated carbon media; Housing: 10 years[3]
HEMEs	HOP-HEME-00001A/B HOP-HEME-00002A/B	X		10 years[3]
Submerged Bed Scrubbers	HOP-SCB-00001 HOP-SCB-00002		X	7 years[2]
HEPA Filters	PJV-HEPA-00004A/B PJV-HEPA-00005A/B	X		HEPA filters to be replaced when needed; Housing: 10 years[3]
Electric Heater	PJV-HTR-00002	X		10 years[3]
Pulse Jet Fans	PJV-FAN-00002A/B	X		10 years[3]
HLW Breakpots				
Plant Wash and Drains Vessel Transfer Breakpot	RLD-BRKPT-00004		X	Located in a black cell. 7 years[2]
Acidic Waste Vessel Transfer Breakpot	RLD-BRKPT-00007 RLD-BRKPT-00009		X	Located in a black cell. 7 years[2]
HLW Sumps				
Active Services Cell Melter Sumps	HFP-SUMP-00001 HFP-SUMP-00004	X		Located in a hard-to-reach area. 10 years[3]
Melter Cave Sumps	HFP-SUMP-00002 HFP-SUMP-00005		X	7 years[2]
SBS Drain Collection Cell Sumps	HOP-SUMP-00003 HOP-SUMP-00008		X	Located in a black cell. 7 years[2]

Table 7 (cont'd) Assessment Schedule

Plant Item Name	Plant Item Number	Lower Potential for Corrosion and Erosion	Higher Potential for Corrosion and Erosion	Assessment Schedule[1]
Melter Cave Sumps	HSH-SUMP-00003 HSH-SUMP-00007	NA	NA	NA[5]
Decontamination Tank Melter Cave Sumps	HSH-SUMP-00008 HSH-SUMP-00009	X		10 years[3]
Canister Rinse Tunnel Sump	HDH-SUMP-00001	X		10 years[3]
Canister Rinse Bogie Maintenance Room Sump	HDH-SUMP-00002	X		10 years[3]
Canister Decontamination Cave Sump	HDH-SUMP-00003	X		10 years[3]
Wet Process Cell Sump	RLD-SUMP-00001	X		Located in a black cell. 10 years[3]
Wet Process Cell Sump	HCP-SUMP-00001		X	Located in a black cell. 7 years[2]
Canister Handling Cave	HPH-SUMP-00001 HPH-SUMP-00003 HPH-SUMP-00005	X		10 years[3]
Underground Transfer Lines				
Piping	NA	X		10 years[3]

Notes:

1 Includes piping associated with the regulated plant item.

2 Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 7 years between integrity assessments.

For hard-to-reach areas and black cells, direct visual or physical inspections of equipment are not possible. Operating history reviews are performed at least every 2 years. Static liquid volume leak tests of tanks are conducted within 7 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests; the age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 7 years between tests.

3 Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 10 years between integrity assessments.

For hard-to-reach areas and black cells, direct visual or physical inspections of equipment are not possible. Operating history reviews are performed at least every 2 years. Static liquid volume leak tests of tanks are conducted within 10 years after start of hot commissioning. Subsequent static liquid volume leak tests will be based on the results of previous leak tests; the age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 10 years between tests.

For underground transfer lines, direct visual or physical inspections are not possible without excavation. Operating history reviews are performed at least every 2 years. Pneumatic leak tests are conducted within 10 years after start of hot commissioning. Subsequent pneumatic leak tests will be based on the results of previous leak tests; the age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 10 years between tests.

Table 7 (cont'd) Assessment Schedule

[4] For purposes of integrity assessment, this accessible regulated plant item is used as a surrogate for inaccessible equipment in the PTF or HLW vitrification facility. Therefore, the frequency of the integrity assessment is consistent with the frequency of the integrity assessment for the inaccessible equipment. See Table 10 for a list of surrogate equipment.

[5] Design life is 5 years. Assessment, other than review of operation and maintenance records on annual or semiannual basis, is not required if melter and melter coolers are replaced within less than 7 years. Otherwise, the initial integrity assessment will be conducted within 7 years after start of hot commissioning; frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the miscellaneous unit system; materials of construction; characteristics of the waste; and any other relevant factors, but there will be no more than 7 years between integrity assessments.

The integrity assessment schedule for the melter cave sumps (HSH-SUMP-00003 and HSH-SUMP-00007) corresponds to the integrity assessment schedule or replacement schedule for the melters and film coolers.

Acronyms:

HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
LAW – low-activity waste
NO_x - nitrogen oxides
PJV – pulse jet ventilation system
PTF - pretreatment facility
SBS - submerged bed scrubber
UNS - unified numbering system
VOC - volatile organic compound

Table 8 **Process Chemistry and Parameters Monitored for Operating History Reviews**

	Aluminum	Chloride	Fluoride	Iron	Nitrate	Nitrite	Phosphate	Sulfate	Mercury	Carbonate	Undissolved solids	Lead	pH	Temperature	Cerium	Hydrogen peroxide	Sodium permanganate	Bromide	Hydroxide	Total organic carbon	Particle size/hardness	Dose rate, α, β/γ (inside)	Time of exposure
PTF																							
CNP-VSL-00003	■	■	■	■	■	■	■	■	■	■			■	■									
CNP-VSL-00004	■	■			■	■	■	■		■			■	■									
CNP-VSL-00001	■	■	■	■	■	■	■	■	■	■			■	■									
CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004	■	■	■	■	■	■	■	■	■	■			■	■									
CXP-VSL-00001	■	■	■	■	■	■	■	■	■	■			■	■									
CXP-VSL-00004					■	■	■			■			■	■									
CXP-VSL-00005					■	■	■			■			■	■									
CXP-VSL-00026A/B/C	■	■	■	■	■	■	■	■	■	■			■	■									
FEP-VSL-00017A/B	■	■	■	■	■	■	■	■	■	■	■		■	■									
FEP-VSL-00005	■	■	■	■	■	■	■	■		■	■		■	■									
FRP-VSL-00002A/B/C/D	■	■	■	■	■	■	■	■	■	■	■		■	■									
HLP-VSL-00028	■	■	■	■	■	■	■	■	■	■	■		■	■									
HLP-VSL-00027A/B	■	■	■	■	■	■	■	■	■	■	■		■	■									
HLP-VSL-00022	■	■	■	■	■	■	■	■	■	■	■		■	■									
PIH-TK-00001											■		■	■									
PVP-VSL-00001	■	■	■	■	■	■	■	■		■	■		■	■									
PWD-VSL-00033	■	■	■	■	■	■	■	■	■	■	■		■	■									

Table 8 (cont'd) **Process Chemistry and Parameters Monitored for Operating History Reviews**

	Aluminum	Chloride	Fluoride	Iron	Nitrate	Nitrite	Phosphate	Sulfate	Mercury	Carbonate	Undissolved solids	Lead	pH	Temperature	Cerium	Hydrogen peroxide	Sodium permanganate	Bromide	Hydroxide	Total organic carbon	Particle size/hardness	Dose rate, α, β/γ (inside)	Time of exposure
PWD-VSL-00043	■	■	■	■	■	■	■	■	■	■	■		■	■									
PWD-VSL-00046													■	■									
PWD-VSL-00015 PWD-VSL-00016	■	■	■	■	■	■	■	■	■	■	■		■	■									
PWD-VSL-00044	■	■	■	■	■	■	■	■	■	■	■		■	■									
RDP-VSL- 00002A/B/C					■								■	■									
RDP-VSL-00004					■								■	■									
RLD-TK-00006A/B	■	■	■	■	■	■	■	■	■	■			■	■									
RLD-VSL-00017A/B		■	■		■								■	■									
TCP-VSL-00001	■	■	■	■	■	■	■	■	■	■			■	■									
TLP-VSL-00002	■	■	■	■	■	■	■	■	■	■			■	■									
TLP-VSL-00009A/B	■	■	■	■	■				■				■	■									
UFP-VSL- 00062A/B/C	■	■	■	■	■	■	■	■	■	■		■	■	■									
UFP-VSL-00001A/B	■	■	■	■	■	■	■	■	■	■	■		■	■									
UFP-VSL-00002A/B	■	■	■	■	■	■	■	■	■	■	■		■	■			■						
UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B	■	■	■	■	■	■	■	■	■	■	■		■	■			■						

Table 8 (cont'd) **Process Chemistry and Parameters Monitored for Operating History Reviews**

	Aluminum	Chloride	Fluoride	Iron	Nitrate	Nitrite	Phosphate	Sulfate	Mercury	Carbonate	Undissolved solids	Lead	pH	Temperature	Cerium	Hydrogen peroxide	Sodium permanganate	Bromide	Hydroxide	Total organic carbon	Particle size/hardness	Dose rate, α, β/γ (inside)	Time of exposure
HLW Vitrification Facility																							
HDH-VSL-00001																							
HDH-VSL-00003																							
HDH-VSL-00002 HDH-VSL-00004																							
HFP-VSL-00001 HFP-VSL-00005																							
HFP-VSL-00002 HFP-VSL-00006																							
HOP-VSL-00903 HOP-VSL-00904																							
HSH-TK-00001 HSH-TK-00002																							
RLD-VSL-00007																							
RLD-VSL-00008																							
RLD-VSL-00002																							

Note:

Shaded cells indicate parameter considered in corrosion and erosion evaluation. See Appendix A for list of applicable Corrosion Evaluation Reports/Material Selection Data Sheets.

Table 9 Summary of Tanks Monitored by the Sampling System

Tank Name	Plant Item Number	Comments
PTF		
Waste Feed Receipt Vessels	FRP-VSL-00002A/B/C/D	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using FRP-PMP-00002A and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
Waste Feed Evaporator Feed Vessels	FEP-VSL-00017A/B	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the feed pumps (FEP-PMP-00007A/B) and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
UFP Feed Preparation Vessels	UFP-VSL-00001A/B	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00041A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.

Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System

Tank Name	Plant Item Number	Comments
UFP Feed Vessels	UFP-VSL-00002A/B	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer pumps (UFP-PMP-00042A/B) and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
UFP Permeate Vessels	UFP-VSL-00062A/B/C	These are tanks considered to have a lower potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
HLW Feed Receipt Vessel	HLP-VSL-00022	This is a tank considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00021 and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
HLW Lag Storage Vessels	HLP-VSL-00027A/B	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00017A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.

Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System

Tank Name	Plant Item Number	Comments
HLW Feed Blending Vessel	HLP-VSL-00028	This is a tank considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using HLP-PMP-00019A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
Cesium IX Treated LAW Vessels	CXP-VSL-00026A/B/C	These are tanks considered to have a lower potential for corrosion and erosion in a black cell.
Cesium Evaporator Recovered Nitric Acid Vessel	CNP-VSL-00004	This is a tank considered to have a lower potential for corrosion and erosion in a black cell. To monitor halide, cesium and nitric acid concentrations, tank contents are routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
LAW SBS Condensate Receipt Vessels	TLP-VSL-00009A/B	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00005A/B and routed to a glovebox. The sampling device is located outside the cell in a shielded but accessible location.
Treated LAW Evaporator Condensate Vessel	TLP-VSL-00002	This is a tank considered to have a lower potential for corrosion and erosion in an accessible location. To monitor process operating conditions, tank contents are pumped from the tank using TLP-PMP-00002A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location.

Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System

Tank Name	Plant Item Number	Comments
Treated LAW Concentrate Storage Vessel	TCP-VSL-00001	This is a tank considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using TCP-PMP-00001A/B and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location on the 56-foot elevation level.
Spent Resin Slurry Vessels	RDP-VSL-00002A/B/C	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tank using RDP-PMP-00008A/B and routed to a semi-autosampler. The sampling device is located outside the cell in a shielded but accessible location.
Spent Resin Dewatering Moisture Separation Vessel	RDP-VSL-00004	This is a tank considered to have a lower potential for corrosion and erosion in an accessible location. Samples collected via the spent resin dewatering sample cylinder (RDP-SMPLR-00001).
Acidic/Alkaline Effluent Vessels	PWD-VSL-00015 PWD-VSL-00016	These are tanks considered to have a higher potential for corrosion and erosion in a black cell. To monitor process operating conditions, tank contents are pumped from the tanks using the transfer ejectors and routed to an autosampler. The sampling device is located outside the cell in a shielded but accessible location.
Plant Wash Vessel	PWD-VSL-00044	This is a tank considered to have a higher potential for corrosion and erosion in a black cell. RFDs, located within the tank, are used to transfer samples to the ASX.

Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System

Tank Name	Plant Item Number	Comments
C3 Floor Drain Collection Vessel	PWD-VSL-00046	This is a tank considered to have a lower potential for corrosion and erosion in an accessible location.
Alkaline Effluent Vessels	RLD-VSL-00017A/B	These are tanks considered to have a lower potential for corrosion and erosion in an accessible location. Tank contents are pumped from the tank using the alkaline effluent pumps (RLD-PMP-00005A/B) and routed to a sampler.
Process Condensate Tanks	RLD-TK-00006A/B	These are tanks considered to have a lower potential for corrosion and erosion in an accessible location. Tank contents are pumped from the tank using the process condensate transfer pumps (RLD-PMP-00011A/B) and routed to a manual sampler.
HLW Vitrification Facility		
Melter Feed Preparation Vessels	HFP-VSL-00001 HFP-VSL-00005	These are tanks considered to have a higher potential for corrosion and erosion in a hot cell. Two mechanical pumps (HFP-PMP-00005A/B or HFP-PMP-00018A/B) to transfer waste to the autosampler.
Melter Feed Vessels	HFP-VSL-00002 HFP-VSL-00006	These are tanks considered to have a higher potential for corrosion and erosion in a hot cell. Sample pump to transfer waste to the autosampler (HFP-PMP-00007 or HFP-PMP-00017).
Plant Wash and Drains Vessel	RLD-VSL-00008	This is a tank considered to have a higher potential for corrosion and erosion in a black cell. The tank contents are sampled to measure the final pH before each transfer to the PTF tank PWD-VSL-00043.

Table 9 (cont'd) Summary of Tanks Monitored by the Sampling System

Tank Name	Plant Item Number	Comments
Acidic Waste Vessel	RLD-VSL-00007	This is a tank considered to have a higher potential for corrosion and erosion in a black cell. The tank contents are sampled to measure the final pH before each transfer to the PTF tank PWD-VSL-00043.

Acronyms:

ASX – autosampling system
HLW - high-level waste
LAW – low-activity waste
PTF - pretreatment facility
RFD - reverse flow diverter
SBS - submerged bed scrubber
UFP - ultrafiltration process

Table 10 **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

Possible Surrogate (Plant Item Number)	Attributes	Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility		
		Direct Correspondence[1]	Similar Attributes[2]	Limited Similarity[3] – Use High Potential Scenario
Laboratory Tanks				
RLD-VSL-00164	6% molybdenum alloy, receives radioactive liquid and discharges to RLD-VSL-00165, corrosion/erosion allowance specified[4]	LAB RLD-VSL-00165[5]		
LAW Tanks				
LCP-VSL-00001 LCP-VSL-00002	316L (S31603), receives concentrated LAW, corrosion/erosion allowance specified[4]	PTF TCP-VSL-00001	PTF CXP-VSL-00001 CXP-VSL-00026A/B/C UFP-VSL-00062A/B/C	
LFP-VSL-00001 LFP-VSL-00002 LFP-VSL-00003 LFP-VSL-00004	316L (S31603), receives concentrated LAW plus glass formers, increased bottom head and shell thickness to provide erosion allowance Represents highest potential scenario for erosion due to contents and from mixing process			PTF FEP-VSL-00017A/B FRP-VSL-00002A/B/C/D HLP-VSL-00022 HLP-VSL-00027A/B HLP-VSL-00028 PWD-VSL-00015 PWD-VSL-00016 PWD-VSL-00033[5] PWD-VSL-00043[5] RDP-VSL-00002A/B/C UFP-VSL-00001A/B UFP-VSL-00002A/B
LOP-VSL-00001 LOP-VSL-00002	Alloy C-22 (N06022), receives SBS condensate, corrosion/erosion allowance specified	HLW HOP-VSL-00903 HOP-VSL-00904	PTF CNP-EVAP-00001 HLP-BRKPT-00004 HLP-BRKPT-00006	

Table 10 (cont'd) **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

Possible Surrogate (Plant Item Number)	Attributes	Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility		
		Direct Correspondence[1]	Similar Attributes[2]	Limited Similarity[3] – Use High Potential Scenario
LVP-TK-00001	316L (S31603), receives caustic solution, corrosion/erosion allowance specified		PTF CNP-VSL-00003 CXP-VSL-00004	
RLD-VSL-00004	316L (S31603), receives radioactive drains, no corrosion/erosion allowance specified		PTF PWD-VSL-00044 PWD-BRKPT-00007 PWD-BRKPT-00008 PWD-BRKPT-00009 PWD-BRKPT-00010 HLW RLD-VSL-00002 RLD-VSL-00008 RLD-BRKPT-00007 RLD-BRKPT-00009	PTF UFP-BRKPT-00001B
RLD-VSL-00005	6% molybdenum alloy (N08367/N08926), receives LAW SBS condensate, possible strongly acidic waste, standard corrosion allowance	PTF TLP-VSL-00009A/B	HLW RLD-VSL-00007	
PTF Tanks in Accessible Areas				
RDP-VSL-00004	304L (S30403), receives spent resin dewatering moisture, strongly acidic, standard corrosion allowance		PTF CNP-VSL-00001 CNP-VSL-00004 CXP-VSL-00005 PVP-VSL-00001 CNP-BRKPT-00001 CNP-BRKPT-00002	HLW RLD-BRKPT-00004

Table 10 (cont'd) **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

Possible Surrogate (Plant Item Number)	Attributes	Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility		
		Direct Correspondence[1]	Similar Attributes[2]	Limited Similarity[3] – Use High Potential Scenario
TLP-VSL-00002	304L (S30403), receives evaporator condensate, pH neutral to alkaline, corrosion/erosion allowance specified		PTF FEP-SEP-00001A/B TLP-SEP-00001	
RLD-VSL-00017A/B	304L (S30403), receives alkaline effluent, corrosion/erosion allowance specified		PTF PWD-BRKPT-00015 PWD-BRKPT-00016 PWD-BRKPT-00017 PWD-BRKPT-00019	
LAW Miscellaneous Units				
LVP-SCB-00001	316L (S31603), receives and scrubs vessel vent gases, corrosion/erosion allowance specified	PTF PVP-SCB-00002		
LOP-WESP-00001 LOP-WESP-00002	6% molybdenum alloy (N08367), receive LAW melter offgas (post-scrubber)	HLW HOP-WESP-00001 HOP-WESP-00002		
LAW Sumps				
RLD-SUMP-00028	316L (S31603), receives radioactive liquid		PTF[6] PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029 PWD-SUMP-00032 PWD-SUMP-00033	

Table 10 (cont'd) **Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells**

Possible Surrogate (Plant Item Number)	Attributes	Hard-to-Reach Area and Black Cell Equipment in Laboratory, PTF, or HLW Vitrification Facility		
		Direct Correspondence[1]	Similar Attributes[2]	Limited Similarity[3] – Use High Potential Scenario
RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036	6% molybdenum alloy (N08367/N08926), receive radioactive drains, standard corrosion allowance	PTF PWD-SUMP-00040 HLW HOP-SUMP-00003 HOP-SUMP-00008 RLD-SUMP-00001 HCP-SUMP-00001		
PTF Sumps in Accessible Areas				
PWD-SUMP-00036	304L (S30403), receives alkaline effluent, standard corrosion allowance	PTF PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A PWD-SUMP-00003 PWD-SUMP-00004 PWD-SUMP-00005 PWD-SUMP-00006 PWD-SUMP-00007 PWD-SUMP-00008 PWD-SUMP-00009 PWD-SUMP-00010 PWD-SUMP-00011 PWD-SUMP-00012 PWD-SUMP-00013		

Notes:

1 Same materials of construction, same waste stream, same corrosion/erosion potential.

2 Same materials of construction, similar waste stream, similar corrosion/erosion potential.

3 Same materials of construction, waste streams different but similar high potential for corrosion/erosion potential based on similar pH conditions or mixing process.

Table 10 (cont'd) Accessible DWP-Regulated Equipment as Possible Surrogates for NDE Measurements of Regulated Equipment in Hard-to-Reach Areas and Black Cells

[4] In addition to standard 0.040-inch corrosion allowance, corrosion evaluation identified tank-specific corrosion/erosion allowances.

[5] One of the DWP-regulated tanks in hard-to-reach locations: RLD-VSL-00165 (analytical laboratory), PWD-VSL-00033 and PWD-VSL-00043 (PTF).

[6] Sumps located in the hot cell and RDMC.

Acronyms:

HLW – high-level waste
LAW – low-activity waste
NDE – non-destructive examination
% - percent
PTF – pretreatment facility
RDMC – remote decontamination maintenance cave
SBS - submerged bed scrubber

Figure 1 **Integrity Assessment Schedule – PTF and HLW Vitrification Facility**

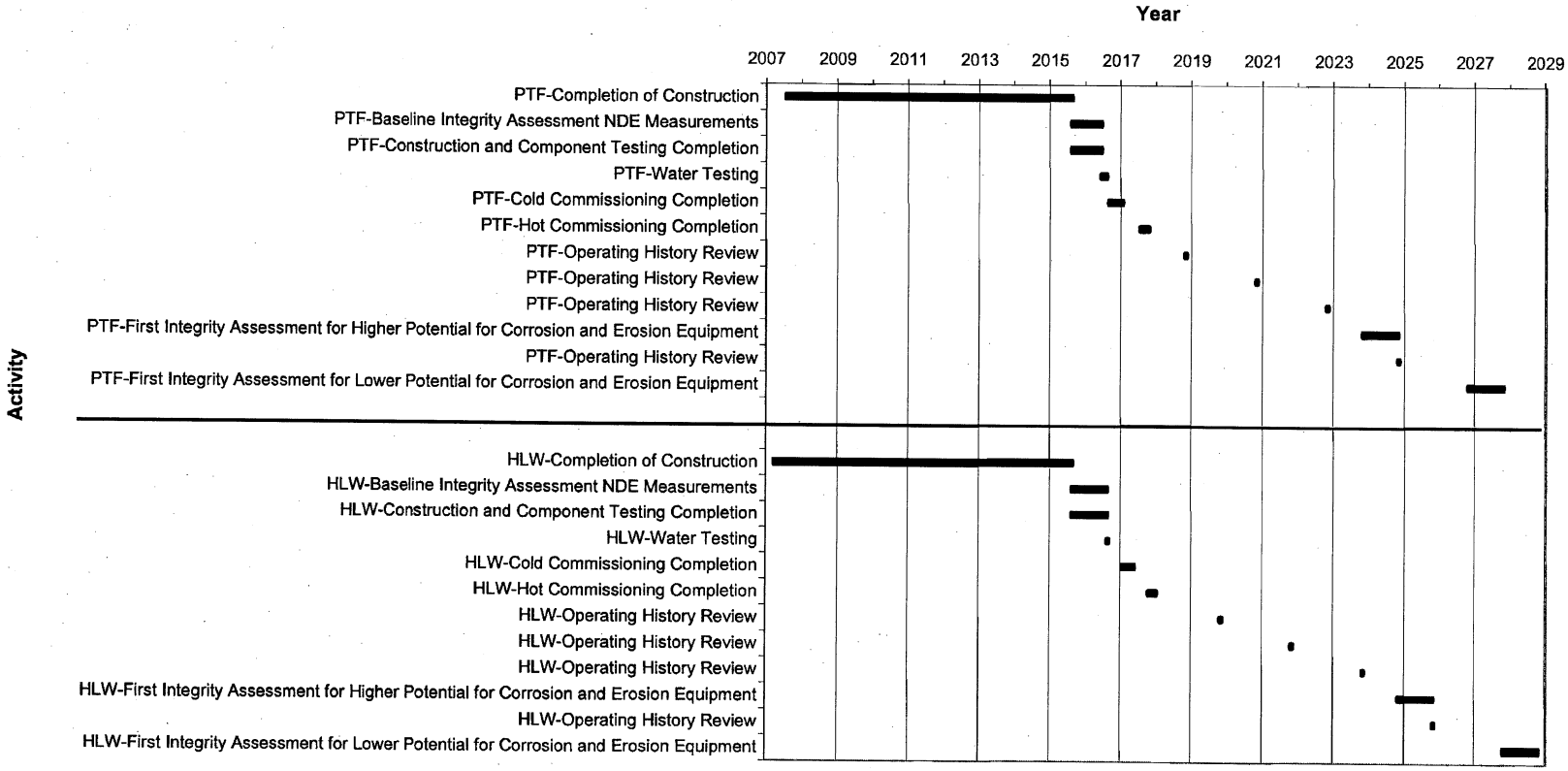

Figure 1 (cont'd) Integrity Assessment Schedule – PTF and HLW Vitrification Facility

Notes:

1 Information in 24590-WTP-RPT-MGT-08-011, dated November 2008, was used to prepare the integrity assessment schedule. This schedule is subject to change.

2 Baseline integrity assessment NDE measurements are to be performed before black cells or hard-to-reach-areas are completely sealed or inaccessible.

3 The schedule for the first few operating history reviews and first integrity assessments is shown. Operating history reviews are performed at least every 2 years. Frequency of subsequent integrity assessments will be based on the results of the current and previous integrity assessments; age of the equipment; materials of construction; characteristics of the waste; and any other relevant factors. See Table 7 for additional information.

Acronyms:

HLW - high-level waste
NDE – non-destructive examination
PTF - pretreatment facility

Appendix A

Applicable Design Documents

Appendix A
Applicable Design Documents

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended

24590-101-TSA-W000-0010-407-1185, *Duratek Mechanical Data Sheet for Film Coolers*

24590-BOF-3PS-C000-T0002, *Engineering Specification for Excavation and Backfill of Underground Radioactive Waste Transfer Lines*

24590-BOF-3PS-CE01-T0001, *Engineering Specification for Excavation and Backfill*

24590-BOF-CS-80-00102, *RAD Transfer Lines, Miscellaneous Details, Sheet 3*

24590-CM-HC4-HXYG-00138-02-00050, *Structural Integrity Assessment of the High-Level Waste (HLW) Melter Cave Support Handling System (HD) Decontamination Tanks (HSH-TK-00001/2)*

24590-CM-POA-HDYR-00001-01-00231, *P&ID HSH Decon Tank 24590-HLW-MT-HSH-TK-00001*

24590-CM-POA-HDYR-00001-01-00252, *P&ID HSH Decon Tank 24590-HLW-MT-HSH-TK-00002*

24590-HLW-3PS-AE00-TP001, *Engineering Specification for High Level Waste Melters*

24590-HLW-3PS-MQR0-T0002, *Engineering Specification for HLW System HDH Canister Rinse Bogie*

24590-HLW-3YD-HDH-00002, *System Description for HLW System HDH Decontamination Handling*

24590-HLW-3YD-HFP-00001, *System Description for HLW Concentrate Receipt and Melter Feed Process Systems (HCP and HFP)*

24590-HLW-3YD-HMP-00001, *System Description for HLW Melter Process System (HMP)*

24590-HLW-3YD-HOP-00001, *System Description for HLW Melter Offgas Treatment Process and Process Vessel Vent Extraction (HOP and PVV Systems)*

24590-HLW-3YD-HSH-00001, *System Description for System HSH-HLW Melter Cave Support Handling*

24590-HLW-3YD-PJV-00001, *System Description for the HLW Pulse Jet Ventilation System (System PJV)*

24590-HLW-3YD-RLD-00001, *System Description for HLW Radioactive Liquid Waste Disposal (System RLD)*

24590-HLW-J0-PTJ-00001, *HLW Vitrification System PTJ Supplemental Instr. Diagram CCTV Equipment Plan at El. -21'-0"*

24590-HLW-J0-PTJ-00002, *HLW Vitrification System PTJ Supplemental Instr. Diagram CCTV Equipment Plan at El. 0'-0"*

24590-HLW-J0-PTJ-00003, *HLW Vitrification System PTJ Supplemental Instr. Diagram CCTV Equipment Plan at El. 14'-0"*

24590-HLW-J0-PTJ-00004, *HLW Vitrification System PTJ Supplemental Instr. Diagram CCTV Equipment Plan at El. 37'-0"*

24590-HLW-J0-PTJ-00005, *HLW Vitrification System PTJ Supplemental Instr. Diagram CCTV Equipment Plan at El. 58'-0"*

24590-HLW-J0-PTJ-00006, *HLW Vitrification System PTJ Supplemental Instr. Diagram CCTV Camera Tables*

Appendix A (cont'd) Applicable Design Documents

24590-HLW-M0-HSH-00072, *HLW Vitrification System HSH, Design Proposal Drawing, Decontamination Tank*

24590-HLW-M5-V17T-00004, *Process Flow Diagram HLW Vitrification Melter 1 Secondary Offgas Treatment (System HOP)*

24590-HLW-M5-V17T-P0001, *Process Flow Diagram HLW Receipt & Feed Preparation (System HCP, GFR, & HFP)*

24590-HLW-M5-V17T-P0002, *Process Flow Diagram HLW Vitrification Melter 1 (Systems HMP and HOP)*

24590-HLW-M5-V17T-P0003, *Process Flow Diagram HLW VIT Primary Offgas Treatment (System HOP)*

24590-HLW-M5-V17T-P0005, *Process Flow Diagram HLW Vitrification Pulse Jet Ventilation Treatment (System PJV)*

24590-HLW-M6-HFP-00005, *P&ID – HLW Melter Feed Process System Melter 1 ADS Control Rack*

24590-HLW-M6-HFP-20005, *P&ID – HLW Melter Feed Process System Melter 2 ADS Control Rack*

24590-HLW-M6-HFP-P0001, *P&ID – HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00001*

24590-HLW-M6-HFP-P0002, *P&ID – HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00002*

24590-HLW-M6-HFP-P20001, *P&ID – HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00005*

24590-HLW-M6-HFP-P20002, *P&ID – HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00006*

24590-HLW-M6-HSH-P0004, *P&ID – HLW System HSH Melter Cave 1 Decontamination System*

24590-HLW-M6-HSH-P20004, *P&ID – HLW System HSH Melter Cave 2 Decontamination System*

24590-HLW-M6-HOP-00001, *P&ID HLW Melter Offgas System Melter 1 Primary Offgas Scrubber*

24590-HLW-M6-HOP-00002, *P&ID HLW Melter Offgas System Melter 1 Primary Offgas WESP*

24590-HLW-M6-HOP-20001, *P&ID HLW Melter Offgas System Melter 2 Primary Offgas Scrubber*

24590-HLW-M6-HOP-20002, *P&ID HLW Melter Offgas System Melter 2 Primary Offgas WESP*

24590-HLW-M6-PJV-00002, *P&ID HLW Pulse Jet Ventilation System Filtration & Monitoring*

24590-HLW-M6-RLD-00001, *P&ID – HLW Radioactive Liquid Waste Disposal System Active Effluent Collection*

24590-HLW-M6-RLD-00002, *P&ID – HLW Radioactive Liquid Waste Disposal System Plant Wash & Drains Vessel*

24590-HLW-M6-RLD-00014, *P&ID – HLW Radioactive Liquid Waste Disposal System Offgas Drains Collection Vessel*

24590-HLW-M6-RLD-00016, *P&ID – HLW Radioactive Liquid Waste Disposal System, Miscellaneous Sumps*

24590-HLW-MAD-HOP-00010, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00001A)*

Appendix A (cont'd) Applicable Design Documents

24590-HLW-MAD-HOP-00011, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00002A)*

24590-HLW-MAD-HOP-00012, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B)*

24590-HLW-MAD-HOP-00013, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00002B)*

24590-HLW-MAD-HOP-00014, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A)*

24590-HLW-MAD-HOP-00015, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00008A)*

24590-HLW-MAD-HOP-00016, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00007B)*

24590-HLW-MAD-HOP-00017, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-HOP-HEPA-00008B)*

24590-HLW-MAD-HOP-00018, *Centrifugal Blower Data Sheet (Plant Item No. 24590-HLW-HOP-FAN-00001A/B/C and HLW-HOP-FAN-00009A/B/C)*

24590-HLW-MAD-HOP-00038, *High-Pressure Centrifugal Blower Data Sheet (Plant Item No. 24590-HLW-HOP-FAN-00008A/B/C and HLW-HOP-FAN-00010A/B/C)*

24590-HLW-MAD-PJV-00004, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00004A)*

24590-HLW-MAD-PJV-00005, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00005A)*

24590-HLW-MAD-PJV-00006, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B)*

24590-HLW-MAD-PJV-00007, *Remote-Change HEPA Filter Housing Data Sheet (Plant Item No. 24590-HLW-MK-PJV-HEPA-00005B)*

24590-HLW-MAD-PJV-00008, *Centrifugal Blower Data Sheet, (Plant Item No. 24590-HLW-PJV-FAN-00002A and 24590-HLW-PJV-FAN-00002B)*

24590-HLW-MED-HOP-P0012, *Mechanical Data Sheet for Plate Heat Exchanger (Plant Item No. 24590-HLW-ME-HOP-HX-00002)*

24590-HLW-MED-HOP-P0013, *Mechanical Data Sheet for HEPA Preheater (Plant Item No. 24590-HLW-ME-HOP-HTR-00002A, 24590-HLW-ME-HOP-HTR-00001B, 24590-HLW-ME-HOP-HTR-00005A, and 24590-HLW-ME-HOP-HTR-00005B)*

24590-HLW-MED-HOP-P0017, *Mechanical Data Sheet for Plate Heat Exchanger (Plant Item No. 24590-HLW-ME-HOP-HX-00004)*

24590-HLW-MED-PJV-00002, *Mechanical Data Sheet for HEPA Preheater*

24590-HLW-MK-HOP-P0001001, *Equipment Assembly HLW Submerged Bed Scrubber, HOP-SCB-00001 (Q), Sheet 1 of 4*

24590-HLW-MKD-HOP-00016, *Mechanical Systems Data Sheet: SBS (Plant Item No. 24590-HLW-MK-HOP-SCB-00001 and 24590-HLW-MK-HOP-SCB-00002)*

Appendix A (cont'd) Applicable Design Documents

24590-HLW-MKD-HOP-P0014, *Mechanical Systems Data Sheet (Plant Item No. 24590-HLW-MV-HOP-ABS-00002)*

24590-HLW-MKD-HOP-P0017, *Mechanical Systems Data Sheet (Plant Item No. 24590-HLW-MV-HOP-ABS-00003)*

24590-HLW-MKD-HOP-P0019, *Mechanical Data Sheet for HLW Catalytic Oxidizer/Reducer (Plant Item No. 24590-HLW-MB-HOP-SCO-00002 and 24590-HLW-MB-HOP-SCO-00003)*

24590-HLW-MKD-HOP-P0020, *Mechanical Data Sheet for HLW Catalytic Oxidizer/Reducer (Plant Item No. 24590-HLW-MB-HOP-SCO-00003)*

24590-HLW-MPD-HDH-00001, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. HDH-PMP-00001*

24590-HLW-MPD-HFP-00007, *Mechanical Systems Data Sheet: Vertical Centrifugal Pump, Plant Item No. 24590-HLW-MP-HFP-PMP-00005A, 24590-HLW-MP-HFP-PMP-00005B, 24590-HLW-MP-HFP-PMP-00018A, 24590-HLW-MP-HFP-PMP-00018B*

24590-HLW-MPD-HFP-00009, *Mechanical Systems Data Sheet: Vertical Centrifugal Pump, Plant Item No. 24590-HLW-MP-HFP-PMP-00007, 24590-HLW-MP-HFP-PMP-00017*

24590-HLW-MPD-RLD-00021, *Mechanical Systems Data Sheet: Air Operated Diaphragm Pump, Plant Item No. 24590-HLW-MP-RLD-PMP-00023*

24590-HLW-MV-HFP-00001, *Equipment Assembly HLW Melter 1 Feed Preparation Vessel HFP-VSL-00001*

24590-HLW-MV-HFP-00002, *Equipment Assembly HLW Melter 1 Feed Vessel HFP-VSL-00002*

24590-HLW-MV-HFP-00009, *Equipment Assembly HLW Melter 2 Feed Preparation Vessel HFP-VSL-00005*

24590-HLW-MV-HFP-00010, *Equipment Assembly HLW Melter 2 Feed Vessel HFP-VSL-00006*

24590-HLW-MV-HOP-P0001, *Equipment Assembly Melter 2 SBS Condensate Receiver Vessel HOP-VSL-00903*

24590-HLW-MV-HOP-P0002001, *Equipment Assembly HLW Primary Offgas HEME, HOP-HEME-00001A/B (Q), Sheet 1 of 3*

24590-HLW-MV-HOP-P0003, *Equipment Assembly Melter 2 SBS Condensate Receiver Vessel HOP-VSL-00904*

24590-HLW-MV-RLD-00002, *Equipment Assembly HLW Offgas Drains Collection Vessel RLD-VSL-00002*

24590-HLW-MV-RLD-00007, *Equipment Assembly, HLW Radioactive Liquid Waste Disposal System, Acidic Waste Transfer Breakpot, RLD-BRKPT-00007*

24590-HLW-MV-RLD-00009, *Equipment Assembly, HLW Radioactive Liquid Waste Disposal System, Acidic Waste Transfer Breakpot, RLD-BRKPT-00009*

24590-HLW-MV-RLD-00012, *Equipment Assembly, HLW Radioactive Liquid Waste Disposal System, Wash Effluent Breakpot, RLD-BRKPT-00004*

24590-HLW-MV-RLD-P0003, *Equipment Assembly Acidic Waste Vessel RLD-VSL-00007*

24590-HLW-MV-RLD-P0004, *Equipment Assembly Plant Wash & Drains Vessel RLD-VSL-00008*

24590-HLW-MVD-HDH-P0003, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00003)*

Appendix A (cont'd) Applicable Design Documents

24590-HLW-MVD-HDH-P0006, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00002)*

24590-HLW-MVD-HDH-P0009, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00001)*

24590-HLW-MVD-HDH-P0012, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HDH-VSL-00004)*

24590-HLW-MVD-HFP-P0010, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00001)*

24590-HLW-MVD-HFP-P0011, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00002)*

24590-HLW-MVD-HFP-P0014, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00005)*

24590-HLW-MVD-HFP-P0015, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HFP-VSL-00006)*

24590-HLW-MVD-HOP-00007, *Mechanical Data Sheet for HEME (Plant Item No. 24590-HLW-MV-HOP-HEME-00001 [A&B]; 24590-HLW-MV-HOP-HEME-00002 [A&B])*

24590-HLW-MVD-HOP-00015, *Mechanical Data Sheet for Activated Carbon Adsorber (Plant Item No. 24590-HLW-MV-HOP-ADBR-00001A and 24590-HLW-MV-HOP-ADBR-00001B)*

24590-HLW-MVD-HOP-00016, *Mechanical Data Sheet for Activated Carbon Adsorber (Plant Item No. 24590-HLW-MV-HOP-ADBR-00002A and 24590-HLW-MV-HOP-ADBR-00002B)*

24590-HLW-MVD-HOP-P0001, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HOP-VSL-00903)*

24590-HLW-MVD-HOP-P0012, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-HOP-VSL-00904)*

24590-HLW-MVD-RLD-P0005, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-RLD-VSL-00007)*

24590-HLW-MVD-RLD-P0007, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-RLD-VSL-00008)*

24590-HLW-MVD-RLD-P0008, *Mechanical Data Sheet for Vessel (Plant Item No. 24590-HLW-MV-RLD-VSL-00002)*

24590-HLW-N1D-HDH-P0003, *Plant Item Material Selection Data Sheet for HDH-VSL-00002 & HDH-VSL-00004*

24590-HLW-N1D-HDH-P0005, *Plant Item Material Selection Data Sheet for HDH-VSL-00003*

24590-HLW-N1D-HDH-P0007, *Plant Item Material Selection Data Sheet for HDH-VSL-00001*

24590-HLW-N1D-HFP-00002, *Corrosion Evaluation, HFP-PMP-00007 & HFP-PMP-00017 (HLW), Melter 1 & 2 Feed Vessel Sample/Recirc Pump*

24590-HLW-N1D-HFP-P0003, *Corrosion Evaluation for HFP-VSL-00001 & HFP-VSL-00005*

24590-HLW-N1D-HFP-P0004, *Plant Item Material Selection Data Sheet for HFP-VSL-00002 & HFP-VSL-00006 (HLW)*

24590-HLW-N1D-HOP-00001, *Corrosion Evaluation for HOP-HEME-00001A/B & 2A/B*

24590-HLW-N1D-HOP-00006, *Corrosion Evaluation for HOP-ABS-00002 & 3*

Appendix A (cont'd) Applicable Design Documents

24590-HLW-N1D-HOP-00008, *HOP-HX-00001 & HOP-HX-00003 (HLW) Catalyst Skid Preheater - Corrosion Evaluation*

24590-HLW-N1D-HOP-00010, *Corrosion Evaluation for HOP-SCB-00001/2*

24590-HLW-N1D-HOP-P0002, *Plant Item Material Selection Data Sheet for HOP-WESP-00001 & HOP-WESP-00002*

24590-HLW-N1D-HOP-P0003, *Plant Item Material Selection Data Sheet for HOP-ADBR-00001A/B & 2A/B*

24590-HLW-N1D-HOP-P0004, *Plant Item Material Selection Data Sheet for HOP-SCO-00001 & HOP-SCO-00004*

24590-HLW-N1D-HOP-P0005, *Plant Item Material Selection Data Sheet for* HOP-SCR-00001 and HOP-SCR-00002

24590-HLW-N1D-HOP-P0007, *Plant Item Material Selection Data Sheet for HOP-HX-00002 and HOP-HX-00004*

24590-HLW-N1D-HSH-P0001, *Plant Item Material Selection Data Sheet for HSH-TK-00001 & 2*

24590-HLW-N1D-RLD-00001, *Corrosion Evaluation for RLD-VSL-00007*

24590-HLW-N1D-RLD-00002, *Corrosion Evaluation for RLD-BRKPT-00007 & RLD-BRKPT-00009*

24590-HLW-N1D-RLD-00006, *Corrosion Evaluation for RLD-VSL-00008*

24590-HLW-N1D-RLD-00009, *Corrosion Evaluation for RLD-BRKPT-00004*

24590-HLW-N1D-RLD-00013, *Corrosion Evaluation for RLD-VSL-00002*

24590-HLW-P1-P01T-00001, *HLW Vitrification Building General Arrangement Plan at El -21 ft - 0 in*

24590-HLW-P1-P01T-00002, *HLW Vitrification Building General Arrangement Plan at El 0 ft - 0 in*

24590-HLW-P1-P01T-00003, *HLW Vitrification Building General Arrangement Plan at El 14 ft - 0 in*

24590-HLW-P1-P01T-00004, *HLW Vitrification Building General Arrangement Plan at El 37 ft - 0 in*

24590-HLW-P1-P01T-00005, *HLW Vitrification Building General Arrangement Plan at El 58 ft - 0 in*

24590-HLW-PER-M-02-001, *HLW Facility Sump Data*

24590-HLW-RPT-ENS-08-002, *Design Basis Event Selection for the High-Level Waste Vitrification Facility Preliminary Safety Analysis Report*

24590-LAB-MVC-RLD-00003, *Process and Materials Selection Data for Hot Cell Drain Collection Vessel (RLD-VSL-00165)*

24590-LAW-N1D-RLD-00002, *RLD-VSL-00005 (LAW) SBS Condensate Collection Vessel*

24590-PTF-3PS-MLFP-TP001, *Engineering Specifications for Ultrafilters*

24590-PTF-3PS-MPC0-T0001, *Engineering Specification for PTF Hot Cell Slurry Pumps to Meet Requirements of API Standard 610, Eighth Edition*

24590-PTF-3YD-CNP-00001, *System Description for Cesium Nitric Acid Recovery Process - System CNP*

24590-PTF-3YD-CXP-00001, *System Description for the Cesium Ion Exchange Process - System CXP*

24590-PTF-3YD-FEP-00001, *System Description for Waste Feed Evaporation Process (FEP)*

24590-PTF-3YD-FRP-00001, *System Description for Waste Feed Receipt Process (FRP)*

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24590-PTF-3YD-HLP-00001, *System Description for HLW Lag Storage and Feed Blending Process System (HLP)*

24590-PTF-3YD-PIH-00001, *System Description for Pretreatment In-Cell Handling System*

24590-PTF-3YD-PJV-00001, *System Description for PTF Pulse Jet Ventilation System (PJV)*

24590-PTF-3YD-PVP-00001, *System Description for Pretreatment Vessel Vent Process System, PVP*

24590-PTF-3YD-PVV-00001, *System Description for Pretreatment Vessel Vent Exhaust System (PVV)*

24590-PTF-3YD-PWD-00001, *System Description for Plant Wash and Disposal System PWD and Radioactive Liquid Waste Disposal System RLD*

24590-PTF-3YD-RDP-00001, *System Description for Spent Resin Collection and Dewatering Process - System RDP*

24590-PTF-3YD-TCP-00001, *System Description for Treated LAW Concentrate Storage Process System (TCP)*

24590-PTF-3YD-TLP-00001, *System Description for Treated LAW Concentrate Evaporation Process System (TLP)*

24590-PTF-3YD-UFP-00001, *System Description for Ultrafiltration Process (UFP)*

24590-PTF-A5-A19T-05201001, *Pretreatment Facility Architectural Room Finish Schedule, El 0'-0"*

24590-PTF-IBCE-AR-03-001, *International Building Code Evaluation for Pretreatment Facility (PTF)*

24590-PTF-M0-PIH-P00001900002, *PTF Vitrification System PIH Design Proposal Drawing Decon Tank Details*

24590-PTF-M0C-PVP-00001, *Duty of Pretreatment Thermal Oxidizer (PVP-OXID-00001)*

24590-PTF-M0D-PIH-P0015, *24590-PTF-MT-PIH-00001 – Pretreatment Facility Decontamination Tank*

24590-PTF-M2-FRP-P0001, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002A*

24590-PTF-M2-FRP-P0002, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002B*

24590-PTF-M2-FRP-P0003, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002C*

24590-PTF-M2-FRP-P0004, *Equipment Assembly Waste Feed Receipt Vessel FRP-VSL-00002D*

24590-PTF-M6-CNP-00001, *P&ID – PTF Cesium Nitric Acid Recovery Process System Eluate Contingency Storage Vessel*

24590-PTF-M6-CNP-00002, *P&ID – PTF Cesium Nitric Acid Recovery Process System Recovered Nitric Acid Vessel*

24590-PTF-M6-CNP-00008, *P&ID – PTF Cesium Nitric Acid Recovery Process System Evaporator*

24590-PTF-M6-CNP-00010, *P&ID – PTF Cesium Nitric Acid Recovery Process System, Rectifier and Condensers*

24590-PTF-M6-CXP-00001001, *P&ID – PTF Cesium Ion Exchange Process System CXP-VSL-00001*

24590-PTF-M6-CXP-00001002, *P&ID – PTF Cesium Ion Exchange Process System CXP-PMP-00001B*

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24590-PTF-M6-CXP-00001003, *P&ID – PTF Cesium Ion Exchange Process System CXP-PMP-00001A*

24590-PTF-M6-CXP-00001004, *P&ID – PTF Cesium Ion Exchange Process System CXP-VSL-00004*

24590-PTF-M6-CXP-00001005, *P&ID – PTF Cesium Ion Exchange Process System CXP-VSL-00005*

24590-PTF-M6-CXP-00010001, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Vessel CXP-VSL-00026A*

24590-PTF-M6-CXP-00010002, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Vessel CXP-VSL-00026B*

24590-PTF-M6-CXP-00010003, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Vessel CXP-VSL-00026C*

24590-PTF-M6-CXP-00010004, *P&ID – PTF Cesium Ion Exchange Process System – Treated LAW Collection Pumps CXP-PMP-00002A/B*

24590-PTF-M6-FEP-00001001, *P&ID – PTF Waste Feed Evaporation Process System Evaporator Feed Vessel FEP-VSL-00017A*

24590-PTF-M6-FEP-00001002, *P&ID – PTF Waste Feed Evaporation Process System Evaporator Feed Vessel FEP-VSL-00017B*

24590-PTF-M6-FEP-00002001, *P&ID – PTF Waste Feed Evaporation Process System Separator FEP-SEP-00001A*

24590-PTF-M6-FEP-00004001, *P&ID – PTF Waste Feed Evaporation Process System Separator FEP-SEP-00001B*

24590-PTF-M6-FRP-00001, *P&ID – PTF Waste Feed Receipt Vessel FRP-VSL-00002A and FRP-VSL-00002B*

24590-PTF-M6-FRP-00002, *P&ID – PTF Waste Feed Receipt Vessel FRP-VSL-00002C and FRP-VSL-00002D*

24590-PTF-M6-FRP-00003, *P&ID – PTF Waste Feed Receipt Process System FRP-PMP-00001 and FRP-PMP-00002A*

24590-PTF-M6-HLP-00001001, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Vessel HLP-VSL-00027A*

24590-PTF-M6-HLP-00001002, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Vessel HLP-VSL-00027B*

24590-PTF-M6-HLP-00001003, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Pumps HLP-PMP-00017A/B*

24590-PTF-M6-HLP-00002001, *P&ID – PTF HLP Feed Receipt Vessel HLP-VSL-00022*

24590-PTF-M6-HLP-00002002, *P&ID – PTF HLP Feed Receipt Transfer Pump HLP-PMP-00021*

24590-PTF-M6-PWD-00003, *P&ID – PTF, Plant Wash & Disposal System Effluent Collection PWD-VSL-00015 and 00016*

24590-PTF-M6-HLP-00003001, *P&ID – PTF HLP Lag Storage and Feed Blending Process System Vessel HLP-VSL-00028*

24590-PTF-M6-HLP-00003002, *P&ID – PTF HLP Lag Storage and Feed Blending Process System HLW Melter Feed Pump HLP-PMP-00019A*

24590-PTF-M6-HLP-00003003, *P&ID – PTF HLP Lag System Pump HLW Melter Feed HLP-PMP-00019B*

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24590-PTF-M6-PVP-00017001, *P&ID – PTF Pretreatment Vessel Vent Process System Caustic Scrubber PVP-SCB-00002*

24590-PTF-M6-PVP-00017002, *P&ID – PTF Pretreatment Vessel Vent Process System Caustic Scrubber PVP-BULGE-00001*

24590-PTF-M6-PVP-00018002, *P&ID – PTF Pretreatment Vessel Vent Process System HEME Drain Collection PVP-VSL-00001/PVP-BULGE-00002*

24590-PTF-M6-PWD-0002001, *P&ID – PTF, Plant Wash & Disposal System Effluent Collection PWD-VSL-00044*

24590-PTF-M6-PVP-00030, *P&ID – PTF Pretreatment Vessel Vent Process System High Point Vent Bulge (ITS) PVP-BULGE-00019*

24590-PTF-M6-PVP-00031, *P&ID – PTF Pretreatment Vessel Vent Process System High Point Vent Bulge (ITS) PVP-BULGE-00020*

24590-PTF-M6-PVP-00032, *P&ID – PTF Pretreatment Vessel Vent Process System High Point Vent Bulge (ITS) PVP-BULGE-00021*

24590-PTF-M6-PWD-00050, *P&ID – PTF, Plant Wash & Disposal System Secondary Containment Leak Detection System*

24590-PTF-M6-PWD-00051, *P&ID – PTF, Plant Wash & Disposal System Secondary Containment Leak Detection System*

24590-PTF-M6-PWD-00057, *PTF - P&ID, Plant Wash & Disposal System Underground Transfer Lines*

24590-PTF-M6-PWD-00058, *PTF - P&ID, Plant Wash & Disposal System Underground Transfer Lines*

24590-PTF-M6-RDP-00001, *P&ID – PTF Ion Exchange Spent Resin Collection and Dewatering Process*

24590-PTF-M6-RDP-00002, *P&ID – PTF Ion Exchange Spent Resin Collection and Dewatering*

24590-PTF-M6-TCP-00001001, *P&ID – PTF Treated LAW Concentrate Storage System TCP-VSL-00001*

24590-PTF-M6-TLP-00001, *P&ID – PTF Treated LAW Evaporation Process System LAW SBS Condensate Receipt TLP-VSL-00009A & 9B*

24590-PTF-M6-TLP-00003, *P&ID – PTF Treated LAW Evaporation Process System Separator TLP-SEP-00001*

24590-PTF-M6-UFP-00001001, *P&ID – PTF Ultrafiltration Process System Feed Preparation Vessel UFP-VSL-00001A*

24590-PTF-M6-UFP-00001003, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00041A and UFP-HX-00041A*

24590-PTF-M6-UFP-00001004, *P&ID – PTF Ultrafiltration Process System Feed Preparation Vessel UFP-VSL-00001B*

24590-PTF-M6-UFP-00001006, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00041B and UFP-HX-00041B*

24590-PTF-M6-UFP-00002001, *P&ID – PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002A*

24590-PTF-M6-UFP-00002003, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00042A and UFP-PMP-00043A*

24590-PTF-M6-UFP-00002008, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00044A*

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24590-PTF-M6-UFP-00003001, *P&ID – PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002B*

24590-PTF-M6-UFP-00003003, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00042B and UFP-PMP-00043B*

24590-PTF-M6-UFP-00003008, *P&ID – PTF Ultrafiltration Process System UFP-PMP-00044B*

24590-PTF-M6-UFP-00004001, *P&ID – PTF Ultrafiltration Process System Permeate Collection Vessel UFP-VSL-00062A*

24590-PTF-M6-UFP-00004002, *P&ID – PTF Ultrafiltration Process System Permeate Collection Vessel UFP-VSL-00062B*

24590-PTF-M6-UFP-00004003, *P&ID – PTF Ultrafiltration Process System Permeate Collection Vessel UFP-VSL-00062C*

24590-PTF-M6-UFP-00031001, *P&ID – PTF Ultrafiltration Process System Utility Services UFP-BULGE-00005*

24590-PTF-M6-UFP-00032001, *P&ID – PTF Ultrafiltration Process System Utility Services UFP-BULGE-00006*

24590-PTF-M6D-PVP-00001, *PVP-FILT-00001 - In-Line Medium Efficiency Air Filter*

24590-PTF-M6E-10-00007, *Incorporating UFP-BULGE-00005/00006 to Calculation*

24590-PTF-M6N-PWD-00226, *Drawing Change Notice for P&ID 24590-PTF-M6-PWD-00011*

24590-PTF-MAD-PJV-00004, *24590-PTF-MA-PJV-FAN-00001A - PJV Exhaust Blower*

24590-PTF-MAD-PJV-00005, *24590-PTF-MA-PJV-FAN-00001B - PJV Exhaust Blower*

24590-PTF-MAD-PJV-00006, *24590-PTF-MA-PJV-FAN-00001C - PJV Exhaust Blower*

24590-PTF-MAD-PVV-00004, *24590-PTF-MA-PVV-FAN-00001A - PVV Exhaust Blower*

24590-PTF-MAD-PVV-00005, *24590-PTF-MA-PVV-FAN-00001B - PVV Exhaust Blower*

24590-PTF-MED-CNP- P0003, *24590-PTF-ME-CNP-HX-00002 - Shell and Tube Heat Exchanger*

24590-PTF-MED-CNP- P0004, *24590-PTF-ME-CNP-HX-00004 - Cesium Evaporator After-Condenser*

24590-PTF-MED-CNP- P0005, *24590-PTF-MB-CNP-HX-00001 - Shell and Tube Heat Exchanger*

24590-PTF-MED-CNP- P0010, *24590-PTF-ME-CNP-HX-00003 - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0003, *24590-PTF-MB-FEP-COND-00001A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0004, *24590-PTF-MB-FEP-COND-00001B - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0005, *24590-PTF-MB-FEP-COND-00002A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0006, *24590-PTF-MB-FEP-COND-00002B - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0007, *24590-PTF-MB-FEP-COND-00003A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0008, *24590-PTF-MB-FEP-COND-00003B - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0009, *24590-PTF-MB-FEP-RBLR-00001A - Shell and Tube Heat Exchanger*

24590-PTF-MED-FEP-P0010, *24590-PTF-MB-FEP-RBLR-00001B - Shell and Tube Heat Exchanger*

24590-PTF-MED-PVP-00001, *24590-PTF-MA-PVP-CLR-00001 – Shell and Tube Heat Exchanger*

24590-PTF-MED-PVP-00002, *24590-PTF-ME-PVP-HX-00002 – Vessel Vent Scrubbing Liquid Cooler*

24590-PTF-MED-TLP-P0001, *24590-PTF-ME-TLP-COND-00001 - Treated LAW Evaporator Primary Condenser*

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24590-PTF-MED-TLP-P0002, *24590-PTF-ME-TLP-COND-00002 - Treated LAW Evaporator Inter-Condenser*

24590-PTF-MED-TLP-P0003, *24590-PTF-ME-TLP-COND-00003 - Treated LAW Evaporator After-Condenser*

24590-PTF-MED-TLP-P0004, *24590-PTF-MB-TLP-RBLR-00001 - Treated LAW Evaporator Reboiler*

24590-PTF-MFC-RLD-00001, *Sizing Calculation for Radioactive Liquid Waste Disposal System (RLD) Jet Mixers (RLD-MXR-00001/2/3/4)*

24590-PTF-MKD-PJV-00001, *24590-PTF-MK-PJV-HEPA-00001-A – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00002, *24590-PTF-MK-PJV-HEPA-00002A – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00003, *24590-PTF-MK-PJV-HEPA-00002B – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00004, *24590-PTF-MK-PJV-HEPA-00002C – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00005, *24590-PTF-MK-PJV-HEPA-00002D – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00006, *24590-PTF-MK-PJV-HEPA-00002D – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00007, *24590-PTF-MK-PJV-HEPA-00002F – Safe Change HEPA Filter Housing Data Sheet*

24590-PTF-MKD-PJV-00016, *24590-PTF-MK-PJV-HEPA-00001-B – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00017, *24590-PTF-MK-PJV-HEPA-00001-C – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00018, *24590-PTF-MK-PJV-HEPA-00001-D – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00019, *24590-PTF-MK-PJV-HEPA-00001-E – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00020, *24590-PTF-MK-PJV-HEPA-00001-F – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PJV-00021, *24590-PTF-MK-PJV-HEPA-00001-G – PJV Primary HEPA Filter Housing*

24590-PTF-MKD-PVP-00001, *24590-PTF-MS-PVP-OXID-00001 – Electrically Heated Regenerative Thermal Oxidizer Data Sheet*

24590-PTF-MKD-PVP-P0002, *24590-PTF-MK-PVP-SCB-00002 – PTF Vessel Vent Caustic Scrubber*

24590-PTF-MKD-PVV-00004, *24590-PTF-MK-PVV-HEPA-00002-A – PVV Secondary HEPA Exhaust Filter Housing*

24590-PTF-MKD-PVV-00005, *224590-PTF-MK-PVV-HEPA-00002B – PVV Secondary HEPA exhaust Filter Housing*

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24590-PTF-MKD-PVV-00007, *24590-PTF-MK-PVV-HEPA-00001-A – PVV Primary HEPA exhaust Filter Housing*

24590-PTF-MKD-PVV-00008, *24590-PTF- MK-PVV-HEPA-00001B – PVV Primary HEPA exhaust Filter Housing*

24590-PTF-MPC-HLP-00013, *Process Data Sheet Input for HLW Melter Feed Pumps HLP-PMP-00019A/B*

24590-PTF-MPC-UFP-00033, *Sizing of the Ultrafiltration Progressive Cavity Pump (UFP-PMP-00044A/B)*

24590-PTF-MPD-CNP-00030, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. 24590-PTF-MP-CNP-PMP-00001*

24590-PTF-MPD-CXP-00009, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. CXP-PMP-00002A/B*

24590-PTF-MPD-CXP-00010, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. CXP-PMP-00001A/B*

24590-PTF-MPD-FEP-00005, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00007A*

24590-PTF-MPD-FEP-00006, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. FEP-PMP-00006A*

24590-PTF-MPD-FEP-00007, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00008A*

24590-PTF-MPD-FEP-00008, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. FEP-PMP-00009A*

24590-PTF-MPD-FEP-00009, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00007B*

24590-PTF-MPD-FEP-00010, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. FEP-PMP-00006B*

24590-PTF-MPD-FEP-00011, *Mechanical Data Sheet: Centrifugal Pump, Plant Item No. FEP-PMP-00008B*

24590-PTF-MPD-FEP-00012, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. FEP-PMP-00009B*

24590-PTF-MPD-FRP-00003, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. FRP-PMP-00001*

24590-PTF-MPD-FRP-00004, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. FRP-PMP-00002A*

24590-PTF-MPD-HLP-00018, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00017A*

24590-PTF-MPD-HLP-00019, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00017B*

24590-PTF-MPD-HLP-00020, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00019A*

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24590-PTF-MPD-HLP-00021, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00019B*

24590-PTF-MPD-HLP-00022, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. HLP-PMP-00021*

24590-PTF-MPD-PVP-00003, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. PVP-PMP-00002A/B*

24590-PTF-MPD-PVP-00009, *Mechanical Systems Data Sheet: Sealless Centrifugal Pump, Plant Item No. PVP-PMP-00001A/B*

24590-PTF-MPD-PWD-00003, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. PWD-PMP-00024A/B*

24590-PTF-MPD-RDP-00003, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. RDP-PMP-00008A/B*

24590-PTF-MPD-RLD-00009, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00005A/B*

24590-PTF-MPD-RLD-00011, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00011A/B*

24590-PTF-MPD-RLD-00012, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00012A/B*

24590-PTF-MPD-RLD-00014, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. RLD-PMP-00014A/B*

24590-PTF-MPD-TCP-00006, *Mechanical Data Sheet: General Centrifugal Pump, Plant Item No. TCP-PMP-00001A/B*

24590-PTF-MPD-TLP-00005, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00005A*

24590-PTF-MPD-TLP-00006, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00002A*

24590-PTF-MPD-TLP-00007, *Mechanical Systems Data Sheet: API 610 Axial Flow Pump, Plant Item No. 24590-PTF-MP-TLP-PMP-00001*

24590-PTF-MPD-TLP-00008, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00011A*

24590-PTF-MPD-TLP-00009, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00005B*

24590-PTF-MPD-TLP-00010, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00002B*

24590-PTF-MPD-TLP-00011, *Mechanical Systems Data Sheet: ASME/ANSI General Centrifugal Pump, Plant Item No. TLP-PMP-00011B*

24590-PTF-MPD-UFP-00022, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00041A*

24590-PTF-MPD-UFP-00023, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00041B*

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24590-PTF-MPD-UFP-00024, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00042A*

24590-PTF-MPD-UFP-00025, *Mechanical Data Sheet: Centrifugal Pump, API-610 Slurry, Plant Item No. UFP-PMP-00042B*

24590-PTF-MTD-RLD-00001, *24590-PTF-MT-RLD-TK-00006A/B – Process Condensate Tanks*

24590-PTF-MV-CNP-00001, *Equipment Assembly Eluate Contingency Storage Vessel CNP-VSL-00003*

24590-PTF-MV-CNP-00002, *Equipment Assembly Cs Evaporator Recovered Nitric Acid Vessel CNP-VSL-00004*

24590-PTF-MV-CNP-00005, *Equipment Assembly Cesium Evaporator Eluate Lute Pot CNP-VSL-00001*

24590-PTF-MV-CXP-00004, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00001 (Q)*

24590-PTF-MV-CXP-00005, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00002 (Q)*

24590-PTF-MV-CXP-00006, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00003 (Q)*

24590-PTF-MV-CXP-00007, *Conceptual Design of Cesium Ion Exchange Column CXP-IXC-00004 (Q)*

24590-PTF-MV-CXP-P0001, *Equipment Assembly Cesium Ion Exchange Feed Vessel CXP-VSL-00001*

24590-PTF-MV-CXP-P0002, *Equipment Assembly Caustic Rinse Collection Vessel CXP-VSL-00004*

24590-PTF-MV-CXP-P0003, *Equipment Assembly Cesium Reagent Vessel CXP-VSL-00005*

24590-PTF-MV-CXP-P0008, *Equipment Assembly Cesium Ion Exchange Treated LAW Collection Vessel CXP-VSL-00026A*

24590-PTF-MV-CXP-P0009, *Equipment Assembly Cesium Ion Exchange Treated LAW Collection Vessel CXP-VSL-00026B*

24590-PTF-MV-CXP-P0010, *Equipment Assembly Cesium Ion Exchange Treated LAW Collection Vessel CXP-VSL-00026C*

24590-PTF-MV-FEP-P0001, *Equipment Assembly Waste Feed Evaporator Feed Vessel FEP-VSL-00017A*

24590-PTF-MV-FEP-P0002, *Equipment Assembly Waste Feed Evaporator Feed Vessel FEP-VSL-00017B*

24590-PTF-MV-HLP-P0003, *Equipment Assembly HLW Feed Receipt Vessel HLP-VSL-00022* 24590-PTF-MV-HLP-P0004, *Equipment Assembly HLW Feed Blending Vessel HLP-VSL-00028*

24590-PTF-MV-HLP-P0005, *Equipment Assembly HLW Lag Storage Vessel HLP-VSL-00027B*

24590-PTF-MV-HLP-P0006, *Equipment Assembly HLW Lag Storage Vessel HLP-VSL-00027A*

24590-PTF-MV-PJV-00002, *Equipment Assembly PTF Demister Vessel PJV-DMST-00001A/B/C Sheet 1 of 2*

24590-PTF-MV-PJV-00003, *Equipment Assembly PTF Demister Vessel PJV-DMST-00001A/B/C Sheet 2 of 2*

24590-PTF-MV-PVP-00003, *Equipment Assembly PTF Vessel Vent HEME PVP-HEME-00001A/B/C Sheet 1 of 2*

24590-PTF-MV-PVP-00004, *Equipment Assembly PTF Vessel Vent HEME PVP-HEME-00001A/B/C Sheet2 of 2*

24590-PTF-MV-PVP-P0002, *Equipment Assembly HEME Drain Collection Vessel PVP-VSL-00001*

Appendix A (cont'd) Applicable Design Documents

24590-PTF-MV-PWD-P0001001, *Equipment Assembly Ultimate Overflow Vessel PWD-VSL-00033 (Q) Sheet 1 of 2*

24590-PTF-MV-PWD-P0001002, *Equipment Assembly Ultimate Overflow Vessel PWD-VSL-00033 (Q) Sheet 2 of 2*

24590-PTF-MV-PWD-P0003001, *Equipment Assembly HLW Effluent Transfer Vessel PWD-VSL-00043 (Q) Sheet 1 of 2*

24590-PTF-MV-PWD-P0003002, *Equipment Assembly HLW Effluent Transfer Vessel PWD-VSL-00043 (Q) Sheet 2 of 2*

24590-PTF-MV-PWD-P0005, *Equipment Assembly C3 Floor Drain Collection Vessel PWD-VSL-00046*

24590-PTF-MV-PWD-P0006, *Equipment Assembly Acidic Alkaline Effluent Vessel PWD-VSL-00016 (Q)*

24590-PTF-MV-PWD-P0007, *Equipment Assembly Acidic Alkaline Effluent Vessel PWD-VSL-00015 (Q)*

24590-PTF-MV-PWD-P0010, *Equipment Assembly Plant Wash Vessel PWD-VSL-00044 (Q)*

24590-PTF-MV-RDP-P0001, *Equipment Assembly Spend Resin Slurry Vessel RDP-VSL-00002A*

24590-PTF-MV-RDP-P0002, *Equipment Assembly Spend Resin Slurry Vessel RDP-VSL-00002B*

24590-PTF-MV-RDP-P0003, *Equipment Assembly Spend Resin Slurry Vessel RDP-VSL-00002C*

24590-PTF-MV-RLD-P0001, *Equipment Assembly Alkaline Effluent Vessel RLD-VSL-00017A*

24590-PTF-MV-RLD-P0002, *Equipment Assembly Alkaline Effluent Vessel RLD-VSL-00017B*

24590-PTF-MV-TCP-P0002, *Equipment Assembly Treated LAW Concentrate Storage Vessel TCP-VSL-00001*

24590-PTF-MV-TLP-P0001, *Equipment Assembly LAW SBS Condensate Receipt Vessel TCP-VSL-00009A*

24590-PTF-MV-TLP-P0002, *Equipment Assembly LAW SBS Condensate Receipt Vessel TCP-VSL-00009B*

24590-PTF-MV-UFP-P0001, *Equipment Assembly Ultrafiltration Feed Preparation Vessel UFP-VSL-00001A*

24590-PTF-MV-UFP-P0002, *Equipment Assembly Ultrafiltration Feed Preparation Vessel UFP-VSL-00001B*

24590-PTF-MV-UFP-P0003, *Equipment Assembly Ultrafiltration Feed Vessel UFP-VSL-00002A*

24590-PTF-MV-UFP-P0004, *Equipment Assembly Ultrafiltration Feed Vessel UFP-VSL-00002B*

24590-PTF-MV-UFP-P0005, *Equipment Assembly Ultrafilter Permeate Vessel UFP-VSL-00062A*

24590-PTF-MV-UFP-P0006, *Equipment Assembly Ultrafilter Permeate Vessel UFP-VSL-00062B*

24590-PTF-MV-UFP-P0007, *Equipment Assembly Ultrafilter Permeate Vessel UFP-VSL-00062C*

24590-PTF-MVC-HLP-00015, *Breakpot Sizing Calculation for the Cs Concentrate Receipt Breakpots (HLP-BRKPT-00004/6)*

24590-PTF-MVC-PWD-00003, *Breakpot Sizing for PTF Break Pots PWD-BRKPT-00015/16*

24590-PTF-MVC-PWD-00058, *Breakpot Sizing for PWD-BRKPT-00017, -00019, -00007, -00009, -00008, -00010*

24590-PTF-MVC-UFP-00010, *Vessel Sizing Calculation for Ultrafiltration Recycle Breakpot UFP-BRKPT-00001B*

Appendix A (cont'd) Applicable Design Documents

24590-PTF-MVD-CNP-00008, *24590-PTF-MVD-CNP-BRKPT-00002 – Cesium Eluate Breakpot*

24590-PTF-MVD-CNP-00009, *24590-PTF-MVD-CNP-BRKPT-00001 – Cesium Concentrate Breakpot*

24590-PTF-MVD-CNP-P0003, *24590-PTF-MV-CNP-VSL-00003 - Eluate Contingency Storage Vessel*

24590-PTF-MVD-CNP-P0006, *24590-PTF-ME-CNP-EVAP-00001 - Cesium Evaporator Separator Vessel CNP-EVAP-00001*

24590-PTF-MVD-CNP-P0007, *24590-PTF-MV-CNP-VSL-00004 - Cs Evaporator Recovered Nitric Acid Vessel*

24590-PTF-MVD-CNP-P0010, *24590-PTF-MV-CNP-VSL-00001 - Cesium Evaporator Eluate Lute Pot*

24590-PTF-MVD-CXP-00017, *24590-PTF-MW-CXP-IXC-00001 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-00018, *24590-PTF-MW-CXP-IXC-00002 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-00019, *24590-PTF-MW-CXP-IXC-00003 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-00020, *24590-PTF-MW-CXP-IXC-00004 – Cesium Ion Exchange Column*

24590-PTF-MVD-CXP-P0007, *24590-PTF-MV-CXP-VSL-00001 – Cs IX Feed Vessel*

24590-PTF-MVD-CXP-P0015, *24590-PTF-MV-CXP-VSL-00004 – Cs IX Caustic Rinse Collection Vessel*

24590-PTF-MVD-CXP-P0016, *24590-PTF-MV-CXP-VSL-00005 – Cs Reagent Vessel*

24590-PTF-MVD-CXP-P0021, *24590-PTF-MV-CXP-VSL-00026A – Cesium Ion Exchange Treated LAW Collection Vessel*

24590-PTF-MVD-CXP-P0022, *24590-PTF-MV-CXP-VSL-00026B – Cesium Ion Exchange Treated LAW Collection Vessel*

24590-PTF-MVD-CXP-P0023, *24590-PTF-MV-CXP-VSL-00026C – Cesium Ion Exchange Treated LAW Collection Vessel*

24590-PTF-MVD-FEP-P0001, *24590-PTF-MV-FEP-VSL-00017A - Waste Feed Evaporator Feed Vessel*

24590-PTF-MVD-FEP-P0002, *24590-PTF-MV-FEP-VSL-00017B - Waste Feed Evaporator Feed Vessel*

24590-PTF-MVD-FEP-P0003, *24590-PTF-MV-FEP-VSL-00005 - Waste Feed Evaporator Condensate Vessel*

24590-PTF-MVD-FEP-P0006, *24590-PTF-MV-FEP-SEP-00001A - Waste Feed Evaporator Separator Vessel*

24590-PTF-MVD-FEP-P0007, *24590-PTF-MV-FEP-SEP-00001B - Waste Feed Evaporator Separator Vessel*

24590-PTF-MVD-FRP-P0005, *24590-PTF-MV-FRP-VSL-00002-A - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-FRP-P0006, *24590-PTF-MV-FRP-VSL-00002-B - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-FRP-P0007, *24590-PTF-MV-FRP-VSL-00002-C - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-FRP-P0008, *24590-PTF-MV-FRP-VSL-00002-D - Waste Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-00010, *24590-PTF-MV-HLP-BRKPT-00004 – HLP System Cs Concentrate Receipt Breakpot*

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24590-PTF-MVD-HLP-00011, *24590-PTF-MV-HLP-BRKPT-00006 – HLP System Cs Concentrate Receipt Breakpot*

24590-PTF-MVD-HLP-P0006, *24590-PTF-MV-HLP-VSL-00022 - HLW Feed Receipt Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-P0007, *24590-PTF-MV-HLP-VSL-00027A - HLW Lag Storage Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-P0008, *24590-PTF-MV-HLP-VSL-00027B - HLW Lag Storage Vessel Mechanical Data Sheet*

24590-PTF-MVD-HLP-P0009, *24590-PTF-MV-HLP-VSL-00028 - HLW Feed Blending Vessel Mechanical Data Sheet*

24590-PTF-MVD-PJV-00004, *24590-PTF-MV-PJV-DMST-00002A/B/C Demister*

24590-PTF-MVD-PJV-P0003, *PJV Drain Collection Vessel*

24590-PTF-MVD-PVP-00004, *24590-PTF-MV-PVP-ADBR-00001A 24590-PTF-MV-PVP-ADBR-00001B – Vessel Vent Carbon Bed Adsorber*

24590-PTF-MVD-PVP-00005, *24590-PTF-MV-PVP-HEME-00001A-00001B-00001C - Vessel Vent HEME – High Efficiency Mist Eliminator*

24590-PTF-MVD-PVP-P0001, *24590-PTF-MV-PVP-VSL-00001 - HEME Drain Collection Vessel*

24590-PTF-MVD-PWD-00015, *24590-PTF-MV-PWD-BRKPT-00015 – Acidic/Alkaline Effluent Breakpot*

24590-PTF-MVD-PWD-00016, *24590-PTF-MV-PWD-BRKPT-00016 – Acidic/Alkaline Effluent Breakpot*

24590-PTF-MVD-PWD-00017, *24590-PTF-MV-PWD-BRKPT-00017 – Breakpot*

24590-PTF-MVD-PWD-00022, *24590-PTF-MV-PWD-BRKPT-00007 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00023, *24590-PTF-MV-PWD-BRKPT-00008 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00024, *24590-PTF-MV-PWD-BRKPT-00009 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00025, *24590-PTF-MV-PWD-BRKPT-00010 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-00026, *24590-PTF-MV-PWD-BRKPT-00019 – Plant Wash and Disposal System Breakpot*

24590-PTF-MVD-PWD-P0001, *24590-PTF-MV-PWD-VSL-00033 – Ultimate Overflow Vessel*

24590-PTF-MVD-PWD-P0002, *24590-PTF-MV-PWD-VSL-00044 – Plant Wash Vessel*

24590-PTF-MVD-PWD-P0003, *24590-PTF-MV-PWD-VSL-00043 - HLW Effluent Transfer Vessel*

24590-PTF-MVD-PWD-P0010, *24590-PTF-MV-PWD-VSL-00046 - C3 Floor Drain Collection Vessel*

24590-PTF-MVD-PWD-P0011, *24590-PTF-MV-PWD-VSL-00015 - Acidic/Alkaline Effluent Vessel*

24590-PTF-MVD-PWD-P0012, *24590-PTF-MV-PWD-VSL-00016 – Acidic/Alkaline Effluent Vessel*

24590-PTF-MVD-RDP-P0005, *24590-PTF-MV-RDP-VSL-00002A – Spent Resin Slurry Vessel Mechanical Data Sheet*

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24590-PTF-MVD-RDP-P0006, *24590-PTF-MV-RDP-VSL-00002B – Spent Resin Slurry Vessel Mechanical Data Sheet*

24590-PTF-MVD-RDP-P0007, *24590-PTF-MV-RDP-VSL-00002C – Spent Resin Slurry Vessel Mechanical Data Sheet*

24590-PTF-MVD-RDP-P0008, *24590-PTF-ME-RDP-VSL-00004 – Mechanical Data Sheet: Vessel*

24590-PTF-MVD-RLD-P0005, *24590-PTF-MV-RLD-VSL-00017A – Alkaline Effluent Vessel*

24590-PTF-MVD-RLD-P0006, *24590-PTF-MV-RLD-VSL-00017B – Alkaline Effluent Vessel*

24590-PTF-MVD-TCP-P0002, *24590-PTF-MV-TCP-VSL-00001 - Treated LAW Concentrate Storage Vessel*

24590-PTF-MVD-TLP-P0001, *24590-PTF-MV-TLP-VSL-00009A - LAW SBS Condensate Receipt Vessel*

24590-PTF-MVD-TLP-P0002, *24590-PTF-MV-TLP-VSL-00009B - LAW SBS Condensate Receipt Vessel*

24590-PTF-MVD-TLP-P0004, *24590-PTF-MV-TLP-VSL-00002 - Treated LAW Evaporator Condensate Vessel*

24590-PTF-MVD-TLP-P0005, *24590-PTF-MV-TLP-SEP-00001 - Treated LAW Evaporator Separator Vessel*

24590-PTF-MVD-UFP-00023, *24590-PTF-MV-UFP-BRKPT-00001B – Ultrafiltration Recycle Breakpot*

24590-PTF-MVD-UFP-P0001, *24590-PTF-MV-UFP-VSL-00001A – Ultrafiltration Feed Preparation Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0002, *24590-PTF-MV-UFP-VSL-00001B – Ultrafiltration Feed Preparation Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0005, *24590-PTF-MV-UFP-VSL-00062A – Ultrafilter Permeate Collection Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0006, *24590-PTF-MV-UFP-VSL-00062B – Ultrafilter Permeate Collection Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0007, *24590-PTF-MV-UFP-VSL-00062C – Ultrafilter Permeate Collection Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0014, *24590-PTF-MV-UFP-VSL-00002A – Ultrafiltration Feed Vessel Mechanical Data Sheet*

24590-PTF-MVD-UFP-P0015, *24590-PTF-MV-UFP-VSL-00002B – Ultrafiltration Feed Vessel Mechanical Data Sheet*

24590-PTF-MWD-CNP-P0001, *24590-PTF-MV-CNP-DISTC-00001 - Cesium Evaporator Nitric Acid Rectifier CNP-DISTC-00001*

24590-PTF-MXD-CRP-00002, *24590-PTF-PY-CRP-BULGE-00001 – Cs Resin Addition Bulge*

24590-PTF-MXD-CXP-00011, *24590-PTF-PY-CXP-BULGE-00004 – Cesium Ion Exchange Process Bulge*

24590-PTF-MXD-PVP-00002, *24590-PTF-PY-PVP-BULGE-00001 - Vessel Vent Caustic Scrubber Transfer Pump Bulge*

24590-PTF-MXD-PVP-00003, *24590-PTF-PY-PVP-BULGE-00002 - Vessel Vent HEME Drain Vessel Pump Bulge*

24590-PTF-MXD-PVP-00015, *24590-PTF-PY-PVP-BULGE-00014 - Vessel Vent Heat Exchanger Bulge*

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24590-PTF-MXD-TCP-00001, *24590-PTF-PY-TCP-BULGE-00004 - Process Bulge*
24590-PTF-MXD-UFP-00001, *24590-PTF-PY-UFP-BULGE-00001 – Ultrafiltration Reagent Bulge*
24590-PTF-MXD-UFP-00002, *24590-PTF-PY-UFP-BULGE-00002 - Ultrafiltration Reagent Bulge*
24590-PTF-N1D-CNP-P0001, *CNP-DISTC-00001-(PTF) Cs Evaporator Nitric Acid Rectifier*
24590-PTF-N1D-CNP-P0002, *CNP-HX-00002 (PTF) Cs Evaporator Primary Condenser*
24590-PTF-N1D-CNP-P0003, *CNP-HX-00003 (PTF) Cs Evaporator Inter-Condenser*
24590-PTF-N1D-CNP-P0004, *CNP-HX-00001 (PTF) Cs Evaporator Concentrate Reboiler*
24590-PTF-N1D-CNP-P0005, *CNP-EVAP-00001 (PTF) Cs Evaporator Separator Vessel*
24590-PTF-N1D-CNP-P0006, *CNP-VSL-00004 PTF - Cs Evaporator Recovered Nitric Acid Vessel*
24590-PTF-N1D-CNP-P0008, *CNP-BRKPT-00002 (PTF) - Cs Eluate Breakpot*
24590-PTF-N1D-CNP-P0009, *CNP-VSL-00003 (PTF) - Eluate Contingency Storage Vessel*
24590-PTF-N1D-CNP-P0010, *CNP-BRKPT-00001, (PTF) - Cs Concentrate Breakpot*
24590-PTF-N1D-CNP-P0011, *CNP-VSL-00001, (PTF) - Cs Evaporator Eluate Lute Pot*
24590-PTF-N1D-CNP-P0012, *CNP-HX-00004 (PTF) - Cs Evaporator After-Condenser*
24590-PTF-N1D-CXP-00002, *CXP-IXC-00001/2/3/4 (PTF) Cs IX Column*
24590-PTF-N1D-CXP-00004, *CXP-HX-00001A/B (PTF) Cs Ion Exchange Feed Cooler*
24590-PTF-N1D-CXP-P0001, *CXP-VSL-00001 (PTF) Cs Ion Exchange Feed Vessel*
24590-PTF-N1D-CXP-P0003, *CXP-VSL-00026 A-B-C (PTF) IX Treated LAW Collection Vessel*
24590-PTF-N1D-CXP-P0007, *CXP-VSL-00004 (PTF) Cs IX Caustic Rinse Collection Vessel*
24590-PTF-N1D-CXP-P0008, *CXP-VSL-00005 (PTF) Cs IX Reagent Vessel*
24590-PTF-N1D-FEP-P0002, *FEP-VSL-00017A-B (PTF) Waste Feed Evaporator Feed Vessels Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FEP-P0003, *FEP-VSL-00005 (PTF) Waste Feed Evaporator Condensate Vessel Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FEP-P0007, *FEP-SEP-00001A-B (PTF) Waste Feed Evaporator Separator Vessels Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FEP-P0008, *FEP-RBLR-00001A/B (PTF) Waste Feed Evaporator Reboilers Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FEP-P0009, *FEP-COND-00002A/B (PTF) Waste Feed Evaporator Intercondensers Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FEP-P0010, *FEP-COND-00003A/B (PTF) Waste Feed Evaporator Aftercondensers Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FEP-P0013, *FEP-COND-00001A/B (PTF) Waste Feed Evaporator Primary Condenser Plant Item Material Selection Data Sheet*
24590-PTF-N1D-FRP-P0001, *FRP-VSL-00002A-D (PTF) Waste Feed Receipt Vessels Plant Item Material Selection Data Sheet*
24590-PTF-N1D-HLP-00002, *Corrosion Evaluation, HLP-PMP-00017A/B (PTF), HLW Solids Transfer Pumps*

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24590-PTF-N1D-HLP-P0001, *HLP-BRKPT-00004 & HLP-BRKPT-00006 (PTF) Cs Concentrate Receipt Breakpots*

24590-PTF-N1D-HLP-P0003, *HLP-VSL-00022 (PTF) HLW Feed Receipt Vessel*

24590-PTF-N1D-HLP-P0007, *HLP-VSL-00027A&B (PTF) HLP Lag Storage Vessels*

24590-PTF-N1D-HLP-P0010, *HLP-VSL-00028 (PTF) HLW Feed Blending Vessel*

24590-PTF-N1D-PIH-P0001, *P1H-TK-00001 (PTF) - Pretreatment Decontamination Tank Decon Soak Tank*

24590-PTF-N1D-PVP-00003, *Corrosion Evaluation, PVP-PMP-00001A/B (PTF), Vessel Vent Scrubber Recirculating Pump*

24590-PTF-N1D-PVP-00005, *PVP-ADBR-00001A/B (PTF) Vessel Vent Carbon Bed Adsorber*

24590-PTF-N1D-PVP-00006, *PVP-HEME-00001A/B (PTF) Vessel Vent HEME (Mist Eliminator)*

24590-PTF-N1D-PVP-P0001, *PVP-SCB-00002 (PTF) Vessel Vent Caustic Scrubber*

24590-PTF-N1D-PVP-P0002, *PVP-VSL-00001 (PTF) HEME Drain Collection Vessel*

24590-PTF-N1D-PWD-P0001, *PWD-VSL-00044 (PTF) – Plant Wash Vessel*

24590-PTF-N1D-PWD-P0002, *PWD-VSL-00043 (PTF) – HLW Effluent Collection Vessel*

24590-PTF-N1D-PWD-P0003, *PWD-VSL-00015 & PWD-VSL-00016 (PTF) - Acidic/Alkaline Effluent Vessel*

24590-PTF-N1D-PWD-P0005, *PWD-VSL-00033, (PTF) - Ultimate Overflow Vessel*

24590-PTF-N1D-PWD-P0006, *PWD-VSL-00046 (PTF) - C3 Floor Drain Collection Vessel*

24590-PTF-N1D-PWD-P0007, *PWD-BRKPT-00007/08/09/10/17/19 (PTF) - Breakpots*

24590-PTF-N1D-PWD-P0008, *PWD-BRKPT-00015 & PWD-BRKPT-00016 (PTF) - Acidic/Alkaline Effluent Breakpots*

24590-PTF-N1D-RDP-P0001, *RDP-VSL-00002A/B/C (PTF) Spent Resin Slurry Vessels*

24590-PTF-N1D-RDP-P0002, *RDP-VSL-00004 (PTF) Spent Resin Dewatering Moisture Separation Vessel*

24590-PTF-N1D-RLD-00001, *RLD-TK-00006-A/B (PTF) Process Condensate Tank*

24590-PTF-N1D-RLD-P0002, *RLD-VSL-00017-A/B (PTF) - Alkaline Effluent Vessels*

24590-PTF-N1D-TCP-00002, *Corrosion Evaluation, TCP-PMP-00001A/B (PTF), Treated LAW Concentrate Transfer Pumps*

24590-PTF-N1D-TCP-P0001, *TCP-VSL-00001 (PTF) Treated LAW Concentrate Storage Vessel*

24590-PTF-N1D-TLP-P0001, *TLP-VSL-00009A&B, (PTF) - LAW SBS Condensate Receipt Vessels*

24590-PTF-N1D-TLP-P0002, *TLP-COND-00001 (PTF) - Treated LAW Evaporator Primary Condenser*

24590-PTF-N1D-TLP-P0003, *TLP-COND-00002 & TLP-COND-00003 (PTF) - Treated LAW Evaporator Intercondenser & Aftercondenser*

24590-PTF-N1D-TLP-P0005, *TLP-SEP-00001 (PTF) - Treated LAW Evaporator Separator Vessel*

24590-PTF-N1D-TLP-P0006, *TLP-VSL-00002 (PTF) - Treated LAW Evaporator Condensate Vessel*

24590-PTF-N1D-TLP-P0011, *TLP-RBLR-00001 (PTF) - Treated LAW Evaporator Reboiler*

24590-PTF-N1D-UFP-00007, *Corrosion Evaluation, UFP-PMP-00042A/B (PTF), Ultrafiltration Recirculation Pumps*

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24590-PTF-N1D-UFP-P0001, *UFP-BRKPT-00001A/B (PTF) Ultrafiltration Recycle Breakpot Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0002, *UFP-PP-00001A/B, 2A/B, 3A/B (PTF) Ultrafilter Pulsepots Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0003, *UFP-VSL-00002A/B (PTF) - Ultrafiltration Feed Vessels Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0004, *UFP-FILT-00001A/B, 2A/B, 3A/B (PTF) - Ultrafilter Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0005, *UFP-VSL-00001A/B PTF - Ultrafiltration Feed Preparation Vessel Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0008, *UFP-VSL-00062-A B C PTF - Ultrafilter Permeate Collection Vessel Plant Item Material Selection Data Sheet*

24590-PTF-N1D-UFP-P0009, *UFP-HX-00001A/B PTF - UFP Slurry Cooler Plant Item Material Selection Data Sheet*

24590-PTF-P1-P01T-P0001, *Pretreatment Facility General Arrangement Plan at El.0 ft - 0 in*

24590-PTF-P1-P01T-P0002, *Pretreatment Facility General Arrangement Plan at El.28 ft - 0 in*

24590-PTF-P1-P01T-P0003, *Pretreatment Facility General Arrangement Plan at El.56 ft - 0 in*

24590-PTF-P1-P01T-P0004, *Pretreatment Facility General Arrangement Plan at El.77 ft - 0 in*

24590-PTF-P1-P01T-P0006, *Pretreatment Facility General Arrangement Plan at El.-45 ft - 0 in*

24590-PTF-PER-M-02-003, Underground Pipe Protection

24590-PTF-PER-M-02-005, *Flooding Volume for Below Grade and 0 Ft Level in PT Facility*

24590-PTF-PER-M-02-006, *Sump Data for PT Facility*

24590-PTF-PER-M-04-001, *Flooding Volume for 56 Ft Level in PT Facility*

24590-PTF-PER-M-04-002, *Sump and Drain Data at 56 Ft Level for PT Facility*

24590-PTF-PER-M-04-0003, *Flooding Volume for 77 Ft Level in PT Facility*

24590-PTF-PER-M-04-0004, *Sump and Drain Data at 77 Ft Level for PT Facility*

24590-PTF-PER-M-04-0005, *Flooding Volume for Room P-0119 in the PT Facility*

24590-PTF-PER-M-04-0006, *Leak Detection for Underground Transfer Lines*

24590-PTF-PER-M-04-0007, *Flooding Volume for Room P-0123A in the PT Facility*

24590-PTF-PER-M-04-0008, *Flooding Volume for Room P-0150 in the PT Facility*

24590-PTF-PER-M-04-0009, *Sump Data for PT Facility - Room P-0150*

24590-PTF-PER-M-04-0010, *Leak Detection Capability in the Pretreatment Facility*

24590-PTF-RPT-ESH-02-002, *Design Basis Event Selection for the Pretreatment Facility Preliminary Safety Analysis Report*

24590-QL-POA-MEVV-00002, *Drawing - Evaporator Project #2 Separator Vessel CNP-EVAP-00001*

24590-QL-POA-MKAS-00003-08-00003, *Instructions - LAW Off Gas Scrubber Operating Instructions*

24590-WTP-3PS-AFPS-TP006, *Field Applied Special Protective Coatings for Secondary Containment Areas*

Appendix A (cont'd) Applicable Design Documents

24590-WTP-3PS-FB01-T0001, *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*

24590-WTP-3PS-G000-T0001, *Engineering Specification for Supplier Quality Assurance Requirements*

24590-WTP-3PS-G000-T0002, *Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication*

24590-WTP-3PS-G000-T0010, *Engineering Specification for Positive Material Identification (PMI) for Construction*

24590-WTP-3PS-MACS-T0004, *Engineering Specification for High Integrity Centrifugal Blowers*

24590-WTP-3PS-MBTV-T0001, *Engineering Specification for Thermal Catalytic Oxidizers/Reducers*

24590-WTP-3PS-MKE0-TP001, *Engineering Specification for Wet Electrostatic Precipitators*

24590-WTP-3PS-MPC0-T0002, *General Centrifugal Pumps to Meet Requirements of ASME B73.1M-2001 and ASME B73.2M-2003 for Commercial (CM) Components*

24590-WTP-3PS-MPC0-T0003, *Sealless Centrifugal Pumps to Meet Requirements of API Standard 685, First Edition, for Quality Level Q*

24590-WTP-3PS-MPC0-T0009, *Engineering Specification for Vessel-Mounted Vertical Transfer Pumps-HLW Facility*

24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*

24590-WTP-3PS-MX00-T0001, *Engineering Specification for Process Bulge Design and Fabrication*

24590-WTP-3PS-P000-T0001, *Piping Material Classes General Description and Summary*

24590-WTP-3PS-PF00-T0001, *Engineering Specification for Rigid Process Jumper, Jumper Support Frame and Nozzle Frame Fabrication for PTF and HLW Facilities*

24590-WTP-3YD-50-00003, *System Description for Pulse Jet Mixer and Sparger Mixing Subsystems*

24590-WTP-DB-ENG-01-001, *Basis of Design*

24590-WTP-GPP-CON-4103, *Subcontractor Surveillance, Acceptance, and Closeout*

24590-WTP-GPP-CON-7101, *Construction Quality Control Program*

24590-WTP-GPP-PADC-002, *Project Records Management*

24590-WTP-GPP-PSQ-051, *Positive Material Identification*

24590-WTP-M4C-V11T-00010, *Process Engineering Mass Balance for WTP*

24590-WTP-MN-ESH-01-001, *Waste Treatment Plant Radiological Control Manual*

24590-WTP-ORC-HR-01-001, *WTP Project Organization Charts*

24590-WTP-PER-J-02-002, *Low-Point Leak Detection in Secondary Containment Systems Including Buried Co-Axial Transfer Lines*

24590-WTP-PER-M-02-003, *Underground Pipe Protection*

24590-WTP-PER-M-03-001, *Annotated Outline for Integrity Assessments of Regulated Plant Items*

24590-WTP-PER-M-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit*

24590-WTP-PER-M-08-001, *Integrity Assessment Program and Schedule for DWP Regulated Equipment in the Analytical Laboratory and Low-Activity Waste Vitrification Facility*

24590-WTP-PSAR-ESH-01-002-01, *Preliminary Documented Safety Analysis to Support Construction Authorization; General Information*

Appendix A (cont'd) Applicable Design Documents

24590-WTP-PSAR-ESH-01-002-02, *Preliminary Documented Safety Analysis to Support Construction Authorization; PT Facility Specific Information*

24590-WTP-PSAR-ESH-01-002-04, *Preliminary Documented Safety Analysis to Support Construction Authorization, HLW Facility Specific Information*

24590-WTP-RPT-ENV-01-003, *Waste Treatment Plant Waste Analysis Plan*

24590-WTP-RPT-ENV-03-002, *Tanks and Miscellaneous Units Regulated by the Dangerous Waste Permit*

24590-WTP-RPT-M-01-001, *Material Selection Report*

24590-WTP-RPT-MGT-08-011, *Monthly Status Report - November 2008*

24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II*

Document Number 141966, *Notice of Concerns for Clamshell Weld Requirements*, dated June 29, 2006

Document Number 144792, *Notice of Concerns for Clamshell Weld Requirements*, dated August 29, 2006

High-Level Waste (HLW) Vitrification Facility Fact Sheet dated May 2008

Titanium Metals Corporation, *Corrosion Resistance of Titanium*

WAC Dangerous Waste Permit WA7890008967, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant dated September 2007

Appendix B

NDE Measurement Locations

Appendix B
NDE Measurement Locations

[Drawings to be added following installation of regulated plant items]

Appendix C
Contingent Prioritized Integrity Assessment Schedules

Appendix C
Contingent Prioritized Integrity Assessment Schedules

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Appendix C (cont'd) Contingent Prioritized Integrity Assessment Schedules

Table C-4b **HLW Vitrification Facility** Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in **Remotely Accessible Cells** with Initial Assessment at **Ten Years** after Hot Commissioning

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Table C-5 **HLW Vitrification Facility** DWP-Regulated Equipment in **Hot Cell Designed for Replacement** within **Seven Years** after Hot Commissioning

Table C-1a PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Candidates
1	Waste Feed Receipt Vessels	FRP-VSL-00002A/B/C/D	PWD-SUMP-00001 PWD-SUMP-00001A PWD-SUMP-00002 PWD-SUMP-00002A TCP-BULGE-00004	LFP-VSL-00001 LFP-VSL-00002 LFP-VSL-00003 LFP-VSL-00004 PWD-SUMP-00036
2	Waste Feed Evaporator Feed Vessels	FEP-VSL-00017A/B	PWD-SUMP-00003	
2	HLW Feed Receipt Vessel	HLP-VSL-00022	PWD-SUMP-00005	
2	HLW Feed Blend Vessel	HLP-VSL-00028	PWD-SUMP-00005	
2	HLW Lag Storage Vessels	HLP-VSL-00027A/B	PWD-SUMP-00006	
2	Ultrafiltration Feed Preparation Vessels	UFP-VSL-00001A/B	PWD-SUMP-00004	
2	Ultrafiltration Feed Vessels	UFP-VSL-00002A/B	PWD-SUMP-00004 UFP-BULGE-00001 UFP-BULGE-00002 UFP-BULGE-00005 UFP-BULGE-00006 TCP-BULGE-00004	
3	Spent Resin Slurry Vessels	RDP-VSL-00002A/B/C	PWD-SUMP-00009 CXP-BULGE-00004 CRP-BULGE-00001	
3	Acidic/Alkaline Effluent Vessels	PWD-VSL-00015 PWD-VSL-00016	PWD-SUMP-00007 CXP-BULGE-00004 CRP-BULGE-00001	
3	Treated LAW Concentrate Storage Vessel	TCP-VSL-00001	PWD-SUMP-00013 TCP-BULGE-00004	LCP-VSL-00001 LCP-VSL-00002 PWD-SUMP-00036
3	LAW SBS Condensate Receipt Vessels	TLP-VSL-00009A/B	PWD-SUMP-00012	RLD-VSL-00005 PWD-SUMP-00036
3	Eluate Contingency Storage Vessel	CNP-VSL-00003	PWD-SUMP-00008	LVP-TK-00001 PWD-SUMP-00036
3	Ultimate Overflow Vessel	PWD-VSL-00033	PWD-SUMP-00040 TCP-BULGE-00004 PVP-BULGE-00001 PVP-BULGE-00002	LFP-VSL-00001 LFP-VSL-00002 LFP-VSL-00003 LFP-VSL-00004 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036
3	Plant Wash Vessel	PWD-VSL-00044	PWD-SUMP-00004 PVP-BULGE-00001 PVP-BULGE-00002	RLD-VSL-00004 PWD-SUMP-00036
4	Black Cell Sumps	PWD-SUMP-00011 PWD-SUMP-00010	NA	PWD-SUMP-00036

Table C-1a (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PTF – pretreatment facility
SBS - submerged bed scrubber

Table C-1b PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Candidates
4	Hot Cell Sumps	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029	NA	LAW RLD-SUMP-00028

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Evaluation of NDE surrogate results
c) Remote NDE

Acronyms:

DWP – dangerous waste permit
NA – not applicable
NDE – non-destructive examination
PTF – pretreatment facility

Table C-1c PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Status[4]
1	Alkaline Effluent Collection Area Sump	PWD-SUMP-00036	NA	NDE SURROGATE SUMP
4	Spent Resin Dewatering Moisture Separation Vessel	RDP-VSL-00004	PWD-SUMP-000031	NDE SURROGATE TANK

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) NDE

4 accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
NA – not applicable
NDE – non-destructive examination
PTF – pretreatment facility

Table C-2a PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Candidates
1	Waste Feed Evaporator Separator Vessels	FEP-SEP-00001A/B	PWD-SUMP-00003	TLP-VSL-00002 PWD-SUMP-00036
1	Cesium Concentrate Receipt Breakpot	HLP-BRKPT-00004	PWD-SUMP-00006	LOP-VSL-00001 LOP-VSL-00002 PWD-SUMP-00036
1	Cesium Concentrate Receipt Breakpot	HLP-BRKPT-00006	PWD-SUMP-00005	
2	Ultrafilter Permeate Vessels	UFP-VSL-00062A/B/C	PWD-SUMP-00004 PWD-SUMP-00003	LCP-VSL-00001 LCP-VSL-00002 PWD-SUMP-00036
2	Ultrafiltration Recycle Breakpots	UFP-BRKPT-00001A/B	PWD-SUMP-00004	RLD-VSL-00004 PWD-SUMP-00036
2	Cesium Ion Exchange Feed Vessel	CXP-VSL-00001	PWD-SUMP-00008	LCP-VSL-00001 LCP-VSL-00002 PWD-SUMP-00036
2	Ion Exchange Caustic Rinse Collection Vessel	CXP-VSL-00004	PWD-SUMP-00008 CXP-BULGE-00004	LVP-TK-00001 PWD-SUMP-00036
2	Cesium Ion Exchange Reagent Vessel	CXP-VSL-00005	PWD-SUMP-00008	RDP-VSL-00004 PWD-SUMP-00036
2	Ion Exchange Treated LAW Collection Vessels	CXP-VSL-00026A/B/C	PWD-SUMP-00011	LCP-VSL-00001 LCP-VSL-00002 PWD-SUMP-00036
3	Cesium Evaporator Eluant Lute Pot	CNP-VSL-00001	PWD-SUMP-00009	RDP-VSL-00004 PWD-SUMP-00036
3	Cesium Evaporator Recovered Nitric Acid Vessel	CNP-VSL-00004		
3	Cesium Evaporator Separator Vessel	CNP-EVAP-00001		LOP-VSL-00001 LOP-VSL-00002 PWD-SUMP-00036
3	Treated LAW Evaporator Separator Vessel	TLP-SEP-00001	PWD-SUMP-00012	TLP-VSL-00002 PWD-SUMP-00036
3	Cesium Concentrate Breakpot	CNP-BRKPT-00001	PWD-SUMP-00008	RDP-VSL-00004 PWD-SUMP-00036
3	Cesium Evaporator Eluate Breakpot	CNP-BRKPT-00002		
3	Vessel Ventilation HEME Drain Collection Vessel	PVP-VSL-00001	PWD-SUMP-00005 PVP-BULGE-00002	
3	Caustic Scrubber	PVP-SCB-00002	PWD-SUMP-00004 PVP-BULGE-00001 PVP-BULGE-00014	LVP-SCB-00001 PWD-SUMP-00036

Table C-2a (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Ten Years after Hot Commissioning

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Candidates
3	HLW Effluent Transfer Vessel	PWD-VSL-00043	PWD-SUMP-00040	LFP-VSL-00001 LFP-VSL-00002 LFP-VSL-00003 LFP-VSL-00004 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036
3	Plant Wash Breakpot	PWD-BRKPT-00007	PWD-SUMP-00010	RLD-VSL-00004 PWD-SUMP-00036
3	Plant Wash Breakpots	PWD-BRKPT-00008 PWD-BRKPT-00009 PWD-BRKPT-00010	PWD-SUMP-00004	
3	Plant Wash Breakpots	PWD-BRKPT-00017	PWD-SUMP-00008	RLD-VSL-00017A/B PWD-SUMP-00036
3	Plant Wash Breakpots	PWD-BRKPT-00019	PWD-SUMP-00010	
3	Acidic/Alkaline Effluent Breakpots	PWD-BRKPT-00015 PWD-BRKPT-00016	PWD-SUMP-00007	

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator
HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PTF - pretreatment facility
HEPA - high efficiency particulate air
NO_x - nitrogen oxides
PJV – pulse jet ventilation system
SBS - submerged bed scrubber

Table C-2b PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Candidates[4]
1	Waste Feed Evaporator Reboilers	FEP-RBLR-00001A/B	PWD-SUMP-00026	NA
2	Ultrafilters	UFP-FILT-00001A/B UFP-FILT-00002A/B UFP-FILT-00003A/B UFP-FILT-00004A/B UFP-FILT-00005A/B	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029	NA
2	Ultrafiltration Pulsepots	UFP-PP-00001A/B UFP-PP-00002A/B UFP-PP-00003A/B	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029 UFP-BULGE-00001 UFP-BULGE-00002	NA
2	Cesium Ion Exchange Columns	CXP-IXC-00001 CXP-IXC-00002 CXP-IXC-00003 CXP-IXC-00004	PWD-SUMP-00026 PWD-SUMP-00028 PWD-SUMP-00029 CRP-BULGE-00001	NA
2	Cesium Evaporator Concentrate Reboiler	CNP-HX-00001	PWD-SUMP-00026	NA
2	Treated LAW Evaporator Reboiler	TLP-RBLR-00001	PWD-SUMP-00029	NA
3	PJV Primary Exhaust HEPA Filters	PJV-HEPA-00001A/B/C/D/E/F/G	NA	NA
3	PJV Demisters	PJV-DMST-00002A/B/C	NA	NA
3	Primary HEPA Filters	PVV-HEPA-00001A/B	NA	NA
3	HEME Filters	PVP-HEME-00001A/B/C	NA	NA
4	Decontamination Soak Tank	PIH-TK-00001	PWD-SUMP-00032 PWD-SUMP-00033	NA
4	RDMC Sumps	PWD-SUMP-00032 PWD-SUMP-00033	NA	LAW RLD-SUMP-00028

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Remote NDE

4 NDE surrogates not identified for equipment that is designed for remote maintenance, can be driven under its own power to a maintenance area, or can be recovered remotely by external means.

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator

Table C-2b (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Ten Years after Hot Commissioning

HLW - high-level waste
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PTF - pretreatment facility

Table C-2c PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Status[4]
1	Treated LAW Evaporator Condensate Vessel	TLP-VSL-00002	PWD-SUMP-00036	NDE SURROGATE TANK
1	Alkaline Effluent Vessels	RLD-VSL-00017A/B	PWD-SUMP-00036	NDE SURROGATE TANK
2	Waste Feed Evaporator Condensate Vessel	FEP-VSL-00005	NA	NA
2	Waste Feed Evaporator Primary Condensers	FEP-COND-00001A/B	NA	NA
2	Waste Feed Evaporator Intercondensers	FEP-COND-00002A/B	NA	NA
2	Waste Feed Evaporator Aftercondensers	FEP-COND-00003A/B	NA	NA
3	Cesium Nitric Acid Rectifier	CNP-DISTC-00001	NA	NA
3	Cesium Evaporator Primary Condenser	CNP-HX-00002	NA	NA
3	Cesium Evaporator Intercondenser	CNP-HX-00003	NA	NA
3	Cesium Evaporator Aftercondenser	CNP-HX-00004	NA	NA
3	Treated LAW Evaporator Primary Condenser	TLP-COND-00001	NA	NA
3	Treated LAW Evaporator Intercondenser	TLP-COND-00002	NA	NA
3	Treated LAW Evaporator Aftercondenser	TLP-COND-00003	NA	NA
3	PJV Secondary Exhaust HEPA Filters	PJV-HEPA-00002A/B/C/D/E/F	NA	NA
3	PJV Exhaust Fans	PJV-FAN-00001A/B/C	NA	NA
3	Carbon Bed Adsorbers	PVP-ADBR-00001A/B	NA	NA
3	After Cooler	PVP-CLR-00001	NA	NA
3	VOC Oxidizer Unit	PVP-OXID-00001	NA	NA
3	Adsorber Outlet Filter	PVP-FILT-00001	NA	NA
3	Scrubbing Liquid Cooler	PVP-HX-00002	PVP-BULGE-00014	NA
3	Secondary HEPA Filters	PVV-HEPA-00002A/B	NA	NA

Table C-2c (cont'd) PTF Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Status[4]
3	Exhaust Fans	PVV-FAN-00001A/B	NA	NA
4	High Point Vent Bulges	PVP-BULGE-00019 PVP-BULGE-00020 PVP-BULGE-00021	NA	NA
4	High Point Vent Bulges	DIW-BULGE-00001 DIW-BULGE-00002	NA	NA
4	Process Condensate Tanks	RLD-TK-00006A/B	RLD-SUMP-00003	NA
4	C3 Floor Drain Collection Vessel	PWD-VSL-00046	PWD-SUMP-00071	NA
4	Other PWD Sumps	PWD-SUMP-00034 PWD-SUMP-00035	NA	NA

Notes:

1 Priority contingent upon the as-built layout of the PTF and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) NDE

4 accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
LAW – low-activity waste
NA – not applicable
NDE – non-destructive examination
PJV – pulse jet ventilation system
PTF - pretreatment facility
PWD – plant wash and disposal system

Table C-3a HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps	Integrity Assessment NDE Surrogate Candidates
1	SBS Condensate Receiver Vessels	HOP-VSL-00903 HOP-VSL-00904	HOP-SUMP-00003 HOP-SUMP-00008	LOP-VSL-00001 LOP-VSL-00002 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036
2	Acidic Waste Vessel	RLD-VSL-00007	HCP-SUMP-00001	RLD-VSL-00005 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036
2	Plant Wash and Drains Vessel	RLD-VSL-00008		RLD-VSL-00004 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036
2	Acidic Waste Vessel Transfer Breakpot	RLD-BRKPT-00007 RLD-BRKPT-00009		RLD-VSL-00004 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036
2	Plant Wash and Drains Vessel Transfer Breakpot	RLD-BRKPT-00004		RDP-VSL-00004 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste

Table C-3a (cont'd) HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells with Initial Assessment at Seven Years after Hot Commissioning

NA – not applicable
NDE – non-destructive examination
SBS - submerged bed scrubber

Table C-3b HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Seven Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps	Integrity Assessment NDE Surrogate Candidates[4]
3	Melter 1 Feed Preparation Vessel Melter 2 Feed Preparation Vessel	HFP-VSL-00001 HFP-VSL-00005	HFP-SUMP-00002 HFP-SUMP-00005	NA
3	Melter 1 Feed Vessel Melter 2 Feed Vessel	HFP-VSL-00002 HFP-VSL-00006		NA
4	Submerged Bed Scrubbers	HOP-SCB-00001 HOP-SCB-00002	HOP-SUMP-00003 HOP-SUMP-00008	NA
4	Melter Cave Sumps[5]	HSH-SUMP-00003 HSH-SUMP-00007	NA	NA

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item. Assessment of sumps HOP-SUMP-00003 and HOP-SUMP-00008 conducted at the same time as the assessment of tanks HOP-VSL-00903 and HOP-VSL-00904 (see Table C-3a).

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Remote NDE

4 NDE surrogates not identified for equipment that is designed for remote maintenance, can be driven under its own power to a maintenance area, or can be recovered remotely by external means.

5 The integrity assessment schedule for the melter cave sumps corresponds to the integrity assessment schedule or replacement schedule for the melters and film coolers (see Table C-5).

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination

Table C-3c HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Seven Years after Hot Commissioning[1,2]

Priority	Plant Item Name	Plant Item Number	Associated Sumps	Integrity Assessment NDE Surrogate Status[3]
NA	NA	NA	NA	NA

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 No DWP-regulated equipment in accessible areas of the HLW vitrification facility has been identified for assessment at 7 years.

3 accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination

Table C-4a HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Black Cells and Hard-to-Reach Areas with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps	Integrity Assessment NDE Surrogate Candidates
1	Wet Electrostatic Precipitators	HOP-WESP-00001 HOP-WESP-00002	HFP-SUMP-00001 HFP-SUMP-00004	LOP-WESP-00001 LOP-WESP-00002
1	Offgas Drains Collection Vessel	RLD-VSL-00002	RLD-SUMP-00001	RLD-VSL-00004 RLD-SUMP-00029 RLD-SUMP-00030 RLD-SUMP-00031 RLD-SUMP-00032 RLD-SUMP-00035 RLD-SUMP-00036

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Static level tests for tanks
c) Evaluation of NDE surrogate results

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NDE – non-destructive examination

Table C-4b HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Remotely Accessible Cells with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps	Integrity Assessment NDE Surrogate Candidates[4]
2	HEMEs	HOP-HEME-00001A/B HOP-HEME-00002A/B	HOP-SUMP-00003 HOP-SUMP-00008	NA
2	HEPA Electric Preheaters	HOP-HTR-00001B HOP-HTR-00002A	NA	NA
2	HEPA Electric Preheaters, Melter 2	HOP-HTR-00005A/B	NA	NA
2	HEPA Filters	HOP-HEPA-00001A/B HOP-HEPA-00002A/B HOP-HEPA-00007A/B HOP-HEPA-00008A/B	NA	NA

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item. Assessment of sumps HOP-SUMP-00003 and HOP-SUMP-00008 conducted at the same time as the assessment of tanks HOP-VSL-00903 and HOP-VSL-00904 (see Table C-3a).

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment
b) Remote NDE

4 NDE surrogates not identified for equipment that is designed for remote maintenance, can be driven under its own power to a maintenance area, or can be recovered remotely by external means.

Acronyms:

DWP – dangerous waste permit
HEME - high efficiency mist eliminator
HEPA - high efficiency particulate air
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination

Table C-4c HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning[1,2,3]

Priority	Plant Item Name	Plant Item Number	Associated Sumps and Bulges	Integrity Assessment NDE Surrogate Status[4]
3	Rinse Tunnel Canister Rinse Vessel	HDH-VSL-00001	HDH-SUMP-00001	NA
3	Waste Neutralization Vessel	HDH-VSL-00003	HDH-SUMP-00003	NA
3	Canister Decon Vessel 1	HDH-VSL-00002		NA
3	Canister Decon Vessel 2	HDH-VSL-00004		NA
3	Decontamination Tank Melter Cave 1	HSH-TK-00001	HSH-SUMP-00008	NA
3	Decontamination Tank Melter Cave 2	HSH-TK-00002	HSH-SUMP-00009	NA
3	Booster Extraction Fans	HOP-FAN-00001A/B/C HOP-FAN-00009A/B/C	NA	NA
3	Catalyst Skid Preheaters	HOP-HX-00001 HOP-HX-00003	NA	NA
3	Catalyst Skid Electric Heaters	HOP-HTR-00001 HOP-HTR-00007	NA	NA
3	Thermal Catalytic Oxidizers	HOP-SCO-00001 HOP-SCO-00004	NA	NA
3	NO_x Selective Catalytic Reducers	HOP-SCR-00001 HOP-SCR-00002	NA	NA
3	Silver Mordenite Preheaters	HOP-HX-00002 HOP-HX-00004	NA	NA
3	Silver Mordenite Columns	HOP-ABS-00002 HOP-ABS-00003	NA	NA
3	Activated Carbon Adsorbers	HOP-ADBR-00001A/B HOP-ADBR-00002A/B	NA	NA
4	Stack Extraction Fans	HOP-FAN-00008A/B/C HOP-FAN-00010A/B/C	NA	NA
4	Electric Heater	PJV-HTR-00002	NA	NA
4	HEPA Filters	PJV-HEPA-00004A/B PJV-HEPA-00005A/B	NA	NA
4	Pulse Jet Fans	PJV-FAN-00002A/B	NA	NA
4	Canister Rinse and Bogie Maintenance area Sump	HDH-SUMP-00002	NA	NA
4	Canister Handling Cave Sumps	HPH-SUMP-00001 HPH-SUMP-00003 HPH-SUMP-00005	NA	NA

Notes:

1 Priority contingent upon the as-built layout of the HLW vitrification facility and actual operation requirements.

2 Assessment includes ancillary equipment and piping associated with the regulated plant item.

3 Integrity assessment procedures include:

a) Review of operating history review records since commissioning or since previous assessment

Table C-4c (cont'd) HLW Vitrification Facility Prioritized Contingent Integrity Assessment Schedule for DWP-Regulated Equipment in Accessible Areas with Initial Assessment at Ten Years after Hot Commissioning

b) Static level tests for tanks
c) NDE

[4] accessible equipment for which NDE measurements can be conducted and which have been identified for use as surrogates for NDE measurements on similar equipment in black cells and hard-to-reach areas, as described in Section 7.1.5

Acronyms:

DWP – dangerous waste permit
HEPA - high efficiency particulate air
HLW - high-level waste
NA – not applicable
NDE – non-destructive examination
NO_x - nitrogen oxides

Table C-5 HLW Vitrification Facility DWP-Regulated Equipment in Hot Cell Designed for Replacement within Seven Years after Hot Commissioning[1,2]

Priority	Plant Item Name	Plant Item Number	Associated Sumps
NA	Melter 1 Melter 2	HMP-MLTR-00001 HMP-MLTR-00002	HSH-SUMP-00003 HSH-SUMP-00007
NA	Film Coolers	HOP-FCLR-00001 HOP-FCLR-00002 HOP-FCLR-00003 HOP-FCLR-00004	

Notes:

1 Design life is 5 years for melters and melter film coolers.

2 Integrity assessment, other than review of operation and maintenance records on annual or semiannual basis, is not required if melter and melter coolers are replaced within 7 years.

Acronyms:

DWP – dangerous waste permit
HLW - high-level waste
NA – not applicable