AR TARGET SHEET

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BNFL Inc.

BNFL-5193-RCRA-01, Rev. 2

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT

RPP-WTP DANGEROUS WASTE PERMIT APPLICATION

Volume I

April 28, 2000

Prepared for:

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Contract DE-AC06-96RL13308

Prepared By:

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2	Environmental Performance Demonstration Plan
3	Quality Assurance Project Plan for the Environmental Performance Demonstration
4	Seismic Analysis and Design Approach
5	Worked Example for Vessel V13024A
6	Flowsheet Results for Envelope A/D at 60 t/d LAW
7	Waste Compatibility and Structural Integrity of System Vessels and Piping
8	Completion Schedule
9	Engineering Drawings
10	Business Sensitive and Confidential Engineering Drawings
11	Report of Pre-Submittal Meeting
12	State Environmental Policy Act Environmental Checklist for the River Protection Project – Waste Treatment Plant

Foreword

The Hanford Site, located in southeastern Washington State, is owned by the US Government and operated by the US Department of Energy (DOE). Dangerous waste and mixed waste (containing both dangerous and radioactive components) are generated and managed on the Hanford Site. Radioactive components are regulated in accordance with the *Atomic Energy Act of 1954*. Dangerous waste components are regulated in accordance with the *Resource Conservation and Recovery Act of 1976(RCRA)*, the *Hazardous and Solid Waste Amendments of 1984*, and/or the *State of Washington Hazardous Waste Management Act of 1976* (as administered through the Washington State Department of Ecology (Ecology) "Dangerous Waste Regulations", *Washington Administrative Code (WAC)* 173-303). This dangerous waste permit application has been developed for the River Protection Project - Waste Treatment Plant (RPP-WTP), a proposed treatment and storage facility.

The dangerous waste permitting framework for the Hanford Site is established in the *Hanford Federal Facility Agreement and Consent Order*, or Tri-Party Agreement (TPA, Ecology and others 1989). The original document addressed the Hanford Site as a single RCRA facility consisting of over 60 treatment, storage, and/or disposal units. The TPA also established a stepwise permitting process that provided for the issuance of an initial RCRA permit for the Hanford Site. Any treatment, storage, and/or disposal unit not included in the initial dangerous waste permit application is incorporated through a permit modification. Treatment, storage, and/or disposal units not yet incorporated into the RCRA permit continue to operate under interim status.

In July 1996, the TPA (Ecology and others 1989) was amended to incorporate DOE's strategy of privatizing future tank waste processing and treatment efforts.

In September 1996, DOE awarded the Part A, RPP-WTP Contract to BNFL Inc. At the conclusion of Part A of the contract, DOE reviewed the deliverables and elected to award BNFL Inc. with a Part B contract in 1998. Part B is divided into two parts. Part B-1 will continue to develop design detail needed to optimize the system, reduce risk, and reduce contingencies. If approved by DOE, BNFL Inc. will complete the design, construction, operation, and eventual deactivation of the RPP-WTP during Part B-2.

This RPP-WTP dangerous waste permit application is prepared as a future addition to the, *Dangerous Waste Portion of the Hanford Facility Wide Resource Conservation and Recovery Act (RCRA) Permit* (Ecology 1994a). For the RPP-WTP, BNFL Inc. is identified as the "operator", "owner", and DOE, is identified as the "land owner".

This dangerous waste permit application addresses the dangerous waste requirements for the RPP-WTP to operate as a treatment and storage unit. Information included is organized according to guidance prepared by Ecology, *Dangerous Waste Permit Application Requirements for Facilities Which Store and/or Treat Dangerous Wastes in Tank Systems and/or Containers* (Ecology 1996a), supplemented with additional information from the RCRA regulations and WAC 173-303. Wherever appropriate, the text refers to information in the *Hanford Facility Dangerous Waste Permit Application, General Information Portion* (DOE-RL 1998), in lieu of repeating information that has already been submitted to and approved by Ecology. Standard conditions I.C. (permit actions), I.E. (duties and requirements), I.F. (signatory requirement), and general conditions II.H. (recordkeeping and reporting), II.L. (design and operation of the facility) are examples of generic RCRA conditions applicable to the RPP-WTP.

For ease of reference, the Ecology alphanumeric checklist identifiers from the permit application guidance documentation (Ecology 1996a) appear in brackets after the chapter headings and subheadings.

A checklist is provided in the first section of this dangerous waste permit application indicating the location of the required information as stated in Ecology's checklist, referenced by the checklist identifiers. This cross-referencing allows for ease of review in instances where the chapters are not organized in the same manner as the guidance. As standard practice for Hanford Facility dangerous waste permit applications, several chapters are provided as standalone documents in the appendices. Supporting information is provided in the supplements to this application.

Application Checklist

Facility name River Protection Project – Waste Treatment Plant

Date Application Received _____

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements		Technically Adequate?	Location in Application
A.	**Part A Form**		Chapter 1
B.	**Facility Description and General Provisions**		Chapter 2
B-1	General Description		2.1
B-1a	Facility Description		2.1.1
B-1a(1)	Facility Overview		2.1.1
B-1a(2)	Description of Dangerous Waste Management Operations and Processes		2.1.1, 2.1.2
B-1a(3)	Other Processes Regulated Under the Dangerous Waste Regulations		2.1.3
B-1a(4)	Other Environmental Permits		2.1.4
B-1b	Construction Schedule		2.1.5
B-2	Topographic Map		2.2, Appendix 2A
B-2a	General Requirements		2.2.1
B-2b	Additional Requirements for Land Disposal Facilities		2.2.2
B-3	Seismic Consideration		2.3
B-4	Traffic Information		2.4
C.	**Waste Analysis**		Chapter 3, Appendix 3A
C-1	Chemical, Biological, and Physical Analyses		Appendix 3A, Section 1,2
C-1a	Waste in Piles		Not Applicable
C-1b	Landfilled Wastes		Not Applicable
C-1c	Wastes Incinerated and Wastes Used in Performance Tests		Not Applicable
C-2	Waste Analysis Plan		Appendix 3A, Section 3,4, and Appendix 3B
C-2a	Detailed Chemical, Physical, and/or Biological Analysis		Appendix 3A, Section 3.3, 4.1, 4.2

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements	Technically Adequate?	Location in Application
C-2a(1) Parameters and Rationale		Appendix 3A, Section 3.3, 4.1, 4.2
C-2a(2) Analytical Methods		Appendix 3A, Tables 3-3, 3-5, 4-1, 4-2, Sections 4.1.3, 4.1.4.4, Appendix 3B
C-2a(3) Generator-Supplied Analyses		Appendix 3A, Section 3.2.1
C-2b Additional Requirements for Wastes Generated Offsite		Appendix 3A, Section 3.2.3
C-2b(1) Parameters and Rationale to Confirm Identity of Offsite Waste		Appendix 3A, Section 3.2.6, 3.3
C-2b(2) Analytical Methods to Confirm Identity of Offsite Wastes		Appendix 3A, Section 3.3, Table 3-3
C-2b(3) Representative Sampling of Incoming Offsite Wastes		Appendix 3A, Section 3.2.2, 3.2.6.1, 4.1.2.1, 4.1.2.2, 4.1.4.1
C-2c Methods for Collecting Samples for Detailed and Confirming Analyses		Appendix 3A, Section 3.2.2.1 3.2.6.1, 4.1.2.3, 4.1.4.1
C-2d Frequency of Analyses		Appendix 3A, Section 3.2.2.1, 3.2.6.1, 4.1.4.2, 4.1.4.3, 4.1.2
C-3 Manifest System		Appendix 3A, Section 5
C-3a Procedures for Receiving Shipments		Appendix 3A, Section 3.2, Table 3-1
C-3b Response to Significant Discrepancies		Not Applicable
C-3c Provisions for Non-acceptance of Shipment		Appendix 3A, Section 3.2.5
C-3c(1) Non-acceptance of Undamaged Shipment		Not Applicable
C-3c(2) Activation of Contingency Plan for Damaged Shipment		Not Applicable
C-4 Tracking System		Appendix 3A, Section 6
D. Process Information		Chapter 4
D-1 Containers		4.3.1

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements	Technically Adequate?	Location in Application
D-1a Description of Containers		4.3.1.1
D-1b Container Management Practices		4.3.1.2
D-1c Container Labeling		4.3.1.3
D-1d Containment Requirements for Storing Containers		4.3.1.4
D-1d(1) Secondary Containment System Design		4.3.1.4.1
D-1d(1)(a) System Design		4.3.1.4.2
D-1d(1)(b) Structural Integrity of Base		4.3.1.4.3
D-1d(1)(c) Containment System Capacity		4.3.1.4.4
D-1d(1)(d) Control of Run-on		4.3.1.4.5
D-1d(2) Removal of Liquids from Containment System		4.3.1.4.6
D-1e Demonstrate that Containment Is Not Required Because Containers Do Not Contain Free Liquids, Waste that Exhibits Ignitability or Reactivity, or Waste Designated F020 - 023, F026, or F027		4.3.1.4.7
D-1f Prevention of Reaction of Ignitable, Reactive, and Incompatible Waste in Containers		4.3.1.4.8
D-1f(1) Management of Certain Reactive Waste in Containers		4.3.1.4.8
D-1f(2) Management of Ignitable and Certain Other Reactive Waste in Containers		4.3.1.4.8
D-1f(3) Design of Areas to Manage Incompatible Waste		4.3.1.4.8
D-2 Tank Systems		4.3.2
D-2a Design, Installation, and Assessment of Tank Systems		4.3.2.1
D-2a(1) Design Requirements		4.3.2.1.1, 4.3.2.2
D-2a(2) Integrity Assessments		4.3.2.3
D-2a(3) Additional Requirements for Existing Tanks		4.3.2.4
D-2a(4) Additional Requirements for New Tanks		4.3.2.5
D-2a(5) Additional Requirements for New On-ground or Underground Tanks		4.3.2.5.1
D-2b Secondary Containment and Release Detection for Tank Systems		4.3.2.6
D-2b(1) Requirements for All Tank Systems		4.3.2.6.1, 4.3.2.6.2
D-2b(2) Additional Requirements for Specific Types of Systems		4.3.2.6.3
D-2b(2)(a) Vault Systems		Not Applicable
D-2b(2)(b) Double-walled Tanks		Not Applicable
D-2b(2)(c) Ancillary Equipment		4.3.2.2.2
D-2c Variances from Secondary Containment Requirements		4.3.2.7
D-2d Tank Management Practices		4.3.2.8
D-2e Labels or Signs		4.3.2.9

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements	Technically Adequate?	Location in Application
D-2f Air Emissions		4.3.2.10
D-2g Management of Ignitable or Reactive Waste in Tank Systems		4.3.2.11
D-2h Management of Incompatible Waste in Tank Systems		4.3.2.11
D-3 Waste Piles		4.4.1
D-4 Surface Impoundments		4.4.2
D-5 Incinerators		4.4.3
D-6 Landfills		4.4.4
D-7 Land Treatment		4.4.5
D-8 Air Emissions Control		4.3.2.10, 4.4.6
D-8a Process Vents		4.3.2.10.2
D-8a(1) Applicability of Subpart AA Standards		4.4.6, Appendix E
D-8a(1)(a) Process Vents Subject to Subpart AA Standards		4.4.6.
D-8a(1)(b) Process Vents Not Subject to Subpart AA Standards		4.4.6
D-8a(1)(c) Re-evaluating Applicability of Subpart AA Standards		4.4.6
D-8a(2) Process Vents - Demonstrating Compliance		4.4.6
D-8a(2)(a) The Basis for Meeting Limits/Reductions		4.4.6
D-8a(2)(b) Demonstrating Compliance via Selected Method		4.4.6
D-8a(2)(c) Design Information and Operating Parameters for Closed Vent Systems and Control Devices		4.4.6
D-8a(2)(d) Re-evaluating Compliance with Subpart AA Standards		4.4.6
D-8b Equipment Leaks		4.3.2.10.3
D-8b(1) Applicability of Subpart BB Standards		Not Applicable
D-8b(1)(a) Equipment Subject to Subpart BB		Not Applicable
D-8b(1)(b) Re-evaluating Applicability of Subpart BB Standards		Not Applicable
D-8b(2) Equipment Leaks – Demonstrating Compliance		Not Applicable
D-8b(2)(a) Procedures for Identifying Equipment Location and Method of Compliance, Marking Equipment, and Ensuring Records are Up-to-date		Not Applicable
D-8b(2)(b) Demonstrating Compliance with D-8b(1)(a) and (2)(a) Procedures		Not Applicable
D-8b(2)(c) Closed Vent Systems or Control Devices: Showing Compliance with Emission Reduction Standards		Not Applicable
D-8c Tanks and Containers		4.3.2.10.4
D-8c(1) Applicability of Subpart CC Standards		4.4.6
D-8c(2) Tank Systems and Container Areas - Demonstrating Compliance		Not Applicable
D-9 Waste Minimization		4.4.7

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements		Technically Adequate?	Location in Application
D-10	Groundwater Monitoring for Land-based Units		4.4.8
E.	**Releases from Solid Waste Management Units**		Chapter 5
E-1	Solid Waste Management Units and Known and Suspected Releases of Dangerous Waste or Constituents		Not Applicable
E-1a	Solid Waste Management Units		Not Applicable
E-1b	Releases		Not Applicable
E-2	Corrective Actions Implemented		Not Applicable
F.	**Procedures to Prevent Hazards**		Chapter 6
F-1	Security		6.1
F-1a	Security Procedures and Equipment		6.1.1
F-1b	Waiver		6.1.2
F-2	Inspection Plan		6.2
F-2a	General Inspection Requirements		6.2.1
F-2b	Inspection Log		6.2.2
F-2c	Schedule for Remedial Action for Problems Revealed		6.2.3
F-2d	Specific Process or Waste Type Inspection Requirements		6.2.4
F-2d(1)	Container Inspections		6.2.4.1
F-2d(2)	Tank System Inspections and Corrective Actions		6.2.4.2
F-2d(2)(a)	Tank System Inspections		6.2.4.2, Appendix 6A
F-2d(2)(b)	Tank Systems - Corrective Actions		6.2.4.2
F-2d(3)	Storage of Ignitable or Reactive Waste		6.2.4.3
F-2d(4)	Air Emissions Control and Detection - Inspections, Monitoring, and Corrective Actions		6.2.4.4
F-2d(4)(a)	Process Vents		6.2.4.4
F-2d(4)(b)	Equipment Leaks		6.2.4.4
F-2d(4)(c)	Tanks and Containers		6.2.4.4
F-2d(5)	Waste Pile Inspection		6.2.4.7
F-2d(6)	Surface Impoundment Inspection		6.2.4.8
F-2d(7)	Incinerator Inspection		6.2.4.9
F-2d(8)	Landfill Inspection		6.2.4.10
F-2d(9)	Land Treatment Facility Inspection		6.2.4.11
F-3	Preparedness and Prevention Requirements		6.3
F-3a	Equipment Requirements		6.3.1
F-3b	Aisle Space Requirement		6.3.2
F-4	Preventive Procedures, Structures, and Equipment		6.4

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements		Technically Adequate?	Location in Application
F-5	Prevention of Reaction of Ignitable, Reactive, and/or Incompatible Waste		6.5
F-5a	Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Waste		6.5
F-5b	Precautions for Handling Ignitable or Reactive Waste and Mixing Incompatible Waste		6.5
F-5b(1)	Ignitable or Reactive Waste In Tanks		6.5
F-5b(2)	Incompatible Waste In Containers or Tanks		6.5
G.	**Contingency Plan**		Chapter 7, Appendix 7A
G-1	General Information		Appendix 7A, Section 1
G-2	Emergency Coordinators		Appendix 7A, Section 3
G-3	Circumstances Prompting Implementation		Appendix 7A, Section 4, Section 6
G-4	Emergency Response Procedures		Appendix 7A, Section 7
G-4a	Notification		Appendix 7A, Section 7
G-4b	Identification of Dangerous Materials		Appendix 7A, Section 5
G-4c	Hazard Assessment and Report		Appendix 7A, Section 4
G-4d	Prevention of Recurrence or Spread of Fires, Explosions, or Releases		Appendix 7A, Section 7.5
G-4e	Post-Emergency Actions		Appendix 7A, Section 8, 11
G-5	Emergency Equipment		Appendix 7A, Section 9
G-6	Coordination Agreements		Appendix 7A, Section 10
G-7	Evacuation Plan		Appendix 7A, Section 7.1.1
G-8	Required Reports, Recordkeeping, and Certifications		Appendix 7A, Section 11
G-8a	General Requirements		Appendix 7A, Section 11
G-8b	Requirements for Tank Systems		Appendix 7A, Section 8.4, 11.1

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements		Technically Adequate?	Location in Application
H.	**Personnel Training**		Chapter 8, Appendix 8A
H-1	Job Title/Job Description		Appendix 8A, Section 3, 4
H-2	Outline of Training Program		Appendix 8A, Appendix B
H-3	Implementation of Training Program		Appendix 8A, Section 4
I.	**Closure and Financial Assurance**		Chapter 11
I-1	Closure Plan/Financial Assurance for Closure		11.1
I-1a	Closure Performance Standard		11.2
I-1a(1)	Closure Standard for Tanks		11.2.1
I-1a(2)	Closure Standard for Internal and/or External Piping		11.2.2
I-1b	Closure Activities		11.3
I-1b(1)	Maximum Extent of Operation		11.3.1
I-1b(2)	Removing Dangerous Waste		11.3.2
I-1b(3)	Decontaminating Structures, Equipment, and Soil		11.3.3
I-1b(4)	Sampling and Analysis to Identify Extent of Decontamination/ Removal and to Verify Achievement of Closure Standard		11.3.4
I-1b(4)(a)	Sampling to Determine Extent of Contamination		11.3.4.1
I-1b(4)(b)	Sampling to Confirm Decontamination of Structures and Soils		11.3.4.2
I-1b(5)	Other Activities		11.4
I-1c	Maximum Waste Inventory		11.5
I-1d	Closure of Waste Piles, Surface Impoundments, Incinerators, Land Treatment, and Miscellaneous Units		11.6
I-1e	Closure of Landfill Units		Not Applicable
I-1f	Schedule for Closure		11.7
I-1g	Extension for Closure Time		11.8
I-1h	Closure Cost Estimate		11.9
I-1i	Financial Assurance Mechanism for Closure		11.1
I-2	Notice in Deed of Already Closed Disposal Units		Not Applicable
I-3	Post-Closure Plan		11.0
I-4	Liability Requirements		11.0
I-4a	Coverage for Sudden Accidental Occurrences		Not Applicable
I-4b	Coverage for Nonsudden Accidental Occurrences		Not Applicable
I-4c	Request for Variance		Not Applicable

State of Washington
Part B Permit Application Review Checklist for
Treatment and Storage in Tanks and Containers

Requirements	Technically Adequate?	Location in Application
J. Other Federal and State Laws		Chapter 13
K. Part B Certification		Chapter 14
References		Chapter 15

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACI	American Concrete Institute
ADD	average daily dose
AE	absorption efficiency
AES	atomic emission spectrometry
AIEC	acute inhalation exposure criteria
AISC	American Institute of Steel Construction
ALARA	as low as reasonably achievable
ALI	annual limit on intake
ANS	American Nuclear Society
ANSI	American National Standards Institute
APCS	air pollution control system
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASIL	acceptance source impact levels
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area-use factor
BAF	bioaccumulation factor
BAF-S	soil-to-tissue transfer factor
BAF-T	tissue-to-tissue transfer factor
BASF	sediment-to-tissue uptake factor
BCF	bioconcentration factors
BED	building emergency director
BEP	building emergency plan
BOD	*Basis of Design*
BOF	balance of facilities
BPIP	Building Profile Input Program
BSF	sediment-to-tissue uptake factor
BTU	British thermal unit
CAA	Federal Clean Air Act
CAS	Chemical Abstract Service
CCB	consumable change-out box
CCR	central control room
CCTV	closed-circuit television
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CETRED	Combustion Emissions Technical Resource Document
CFR	*Code of Federal Regulations*
CMBST	combustion (LDR treatment standard)

COC	constituents of concern
COPC	constituent of potential concern
CSA	container storage area
CST	crystalline silicotitanate
CVAA	cold vapor atomic absorption
CWC	central waste complex
CWS	central waste storage
DEFT	decision error feasibility trials
DF	decontamination factors
DNA	deoxyribonucleic acid
DOE	US Department of Energy
DOE-ORP	US Department of Energy, Office of River Protection
DOE-RL	US Department of Energy, Richland Operations Office
DOH	Washington State Department of Health
DQO	data quality objective
DQO/DEFT	data quality objective/decision error feasibility trials (software)
DRE	destruction and removal efficiency
DSC	distributed control system
DSCM	dry standard cubic meter
DSF	design safety feature
DST	double-shell tank
DWM	dangerous waste management
DWPA	Dangerous Waste Permit Application
DWTP	Dangerous Waste Training Program
ECAO	Environmental Criteria and Assessment Office (EPA)
Ecology	Washington State Department of Ecology
ED	duration of exposure
EDL	estimated detection limit
EF	exposure frequency
EHW	extremely hazardous waste
EPA	US Environmental Protection Agency
EPCRA	*Emergency Planning and Community Right-to-Know Act*
EPDP	Environmental Performance Demonstration Project
EPS	emergency power system
EQL	estimated quantitation limits
ERA	ecological risk assessment
ERO	emergency response organization
ES&H	environmental safety and health
ESP	electrostatic precipitator
ESU	evolutionarily significant units
ETF	effluent treatment facility
FEALE	Fitzner-Eberhardt Arid Lands Ecology Reserve
FRA	final risk assessment
GC	gas chromatography
GFAA	graphite furnace atomic absorption
GTAW	gas transfer arc welding

HAMMER	hazardous materials management and emergency response
HAP	hazardous air pollutants
HAR	hazard analysis report
HASP	health and safety plan
HAZWRAP	Hazardous Waste Remedial Actions Program
HEAST	Health Effects Assessment Summary Tables
HEME	high efficiency mist eliminator
HEMF	high efficiency metal filter
HEPA	high efficiency particulate air
HHRA	human health risk assessment
HI	hazard index
HLVIT	high-level vitrification
HLW	high-level waste
HQ	hazard quotient
HSLWWAC	Hanford Site liquid waste work acceptance criteria
HSSWAC	Hanford Site solid waste acceptance criteria
HSWA	*Hazardous and Solid Waste Amendments*
HVAC	heating, ventilating and air-conditioning
HWMA	*Hazardous Waste Management Act*
IAEA	International Atomic Energy Agency
IC	ion chromatography
ICP	inductively coupled plasma
ICS	integrated control system
ID	identification
IDLH	immediately dangerous to life or health
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
IRIS	Integrated Risk Information System
ISCST3	Industrial Source Complex Short Term Model, Version 3
ISMP	*Integrated Safety Management Plan*
K_{ow}	octanol/water partition coefficient
LADD	lifetime average daily dose
LAW	low-activity waste
LCR	licensee controlled requirement
LDR	land disposal restrictions
LERF	liquid effluent retention facility
LIGO	laser interferometer gravitational wave observatory
LLBG	low level burial ground
LOAEL	lowest-observed adverse effect level
LSM	locally shielded melter
MACT	maximum achievable control technology
MDL	method detection limit
MF	metabolism factor
MIS	management information systems
MPRM	meteorological processor for regulatory models
MS	mass spectrometry

MSDS	material safety data sheet
MSL	mean sea level
MSM	master slave manipulator
MTCA	*Model Toxic Control Act*
NAAQS	National Ambient Air Quality Standard
NAWQC	National Ambient Water Quality Criteria
NDE	nondestructive evaluation
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NOAEL	no observed adverse effect level
NOF	oxides of nitrogen
NRC	Nuclear Regulatory Commission
NSPS	New Source Performance Standards
NWS	National Weather Service
OVA	organic vapor analyzer
PAH	polycyclic aromatic hydrocarbon
PC	performance category
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
PFD	process flow diagram
PGA	peak ground acceleration
PIC	plant information computer
PIC	product of incomplete combustion
PJM	pulse-jet mixer
PODC	principal organic dangerous constituent
PPE	personal protective equipment
PQL	practical quantitation limit
PRA	preliminary risk assessment
PSD	prevention of significant deterioration of air quality
PTP	performance test plan
PUREX	plutonium uranium extraction plant
QAPjP	quality assurance project plan
RAWP	risk assessment work plan
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	radiological control technician
RDL	reported detection limit
RfC	reference concentration
RFD	reverse flow diverters
RfD	reference dose
RME	reasonable maximum exposure
RMP	risk management program
RPF	relative potency factor
RPP-WTP	River Protection Project - Waste Treatment Plant
SAA	satellite accumulation area
SADAR	*Seismic Analysis and Design Approach* (report)

SALDS	State-Approved Land Disposal System
SAP	safety and health plan
SBS	submerged bed scrubber
SCBA	self-contained breathing apparatus
SCR	selective catalytic reduction
SDSTR	*Seismic Design Standard Technical Report*
SEPA	*State (of Washington) Environmental Policy Act*
SFD	system flow diagram
SIE	selective ion electrode
SLRA	screening level risk assessment
SOM	shift operation manager
SP	soil-to-plant transfer factor
SPCC	spill prevention, control and countermeasures
SRD	safety requirements document
SRE	system removal efficiency
SSCs	structures, systems, and components
SST	single-shell tank
SVOA	semi-volatile organic analysis
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
T&E	threatened and endangered
TAP	toxic air pollutant
TCLP	toxicity characteristic leaching procedure
TCO	thermal catalytic oxidation
TEDF	treated effluent disposal facility
TEF	toxicity equivalency factor
TEQ	toxicity equivalent
TNC	The Nature Conservancy
TOE	total organic emission
TPA	*Hanford Federal Facility Agreement and Consent Order*, also known as the Tri-Party Agreement
TRU	transuranic
TRV	toxicity reference value
TSCA	*Toxic Substances Control Act*
TSD	treatment, storage and/or disposal
TSR	technical safety requirement
TUF	temporal-use factor
TWINS	Tank Waste Information Network System
TWRS	Tank Waste Remediation System
UBC	Uniform Building Code
UFC	Uniform Fire Code
UHC	underlying hazardous constituents
UR	unit risk
USFWS	U.S. Fish and Wildlife Service
UTS	Universal Treatment Standards
VDU	video display unit

VFD	ventilation flow diagram
VOA	volatile organic analysis
VOC	volatile organic compound
VSL	Vitreous State Laboratory
WAC	*Washington Administrative Code*
WAP	waste analysis plan
WAPS	Waste Acceptance Product Specifications
WDFW	Washington Department of Fish and Wildlife
WESP	wet electrostatic precipitator
WHC	Westinghouse Hanford Company
WIPP	waste isolation pilot plant
Work Plan	*Final Work Plan for Screening Level Risk Assessment for the RPP-WTP*
WPPSS	Washington Public Power Supply System
WRAP	waste receiving and processing
WSDOT	Washington State Department of Transportation
WTP	waste treatment plant

Glossary

This dangerous waste permit application relies on the definitions of terms as contained in Appendix 2B of the *Hanford Facility Dangerous Waste Permit Application, General Information Portion* (DOE-RL 1998), except as supplemented or amended below.

close, closure	The deactivation, stabilization, and surveillance of dangerous waste management units at a treatment, storage, and/or disposal facility that has discontinued operation in accordance with a *Resource Conservation and Recovery Act of 1976* (RCRA) closure plan approved by the Washington State Department of Ecology (Ecology). The closure plan will contain the applicable elements required under *Washington Administrative Control* (WAC) 173-303-610.
constituent (of waste)	A chemical constituent of the waste which defines its character. Constituents vary in form, such as solids and liquids, and in chemical composition, such as sodium, nitrate, technetium, cesium, and strontium.
contractor	The private company selected to contract with the U.S. Department of Energy (DOE) for construction and operation of the technologies and facilities necessary to receive and process tank waste, and to deliver waste products to DOE for storage or disposal.
DOE	U.S. Department of Energy, Headquarters, Washington, D.C. Owns the land the Hanford Site occupies.
DOE-RL	U.S. Department of Energy, Richland Operations Office, Richland, Washington.
double-shell tank (DST)	A reinforced concrete underground vessel with two inner steel liners that provide containment and backup containment of liquid waste. The annulus between the liners is instrumented to permit detection of leaks from the inner liner. There are 28 DSTs at the Hanford Site.
DOE-ORP	U.S. Department of Energy, Office of River Protection, Richland, Washington. BNFL Inc. has the RPP-WTP Contract with DOE-ORP.
feed, LAW	A highly radioactive mixed waste stream from the DST system unit tank farm containing a low percentage by weight of solids, and exhibiting a lower level of activity than the HLW feed. It is generally the supernatant portion of the tank waste.
feed, HLW	A highly radioactive mixed waste stream from the DST system unit tank farm containing a high percentage by weight of solids.

Hanford Site	A 570 square mile reservation owned by the Federal Government and located in southeast Washington State. Established in 1943 as part of the Manhattan Project, the chief mission of the Hanford Site was to produce plutonium for use in nuclear weapons for national defense. The Hanford Site has had nine production reactors and four chemical separation plants. The current mission at the Hanford Site is environmental cleanup, including the development of cleanup related technologies.
immobilization	The act or process of reducing the mobility of waste constituents, to limit their potential for long-term transport in the biosphere and subsequent exposure to humans, animals, and plants. Vitrification is an example of an immobilization process.
incidental waste	Radioactive waste generated incidentally to the production or separation of special nuclear material. Operationally, this is the waste resulting from the removal of all radionuclides that can be separated, reasonably and economically, from the wastes generated by the production or separation of special nuclear material. Immobilized low-activity waste (ILAW) is considered incidental waste.
pretreatment	A chemical or physical treatment process, or series of processes, used to prepare waste for immobilization.
supernate, supernatant	The liquid layer that is above the solids in waste storage tanks; i.e., drainable liquid, minus drainable interstitial liquid. Supernatant volume is usually determined by subtracting the solids level measurement from the liquid level measurement. In some cases, this supernatant volume includes the volumes of any floating solid crusts, because their volumes cannot be measured.
Tri-Party Agreement (TPA)	The *Hanford Federal Facility Agreement and Consent Order* (known as the Tri-Party Agreement) (Ecology et al. 1989), initially signed in 1989 and subsequently amended by the Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office. The TPA, which is legally enforceable, defines the responsibilities, management, regulatory focus, and schedule for compliance with the *Resource Conservation and Recovery Act* (RCRA), *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA), and the *State of Washington Hazardous Waste Management Act* (HWMA) at the Hanford Site.
vitrification	A method of immobilizing radioactive waste. The process involves melting waste and glass forming chemicals in a joule-heated vessel, and then pouring the melt into a storage canister before solidification.
waste, immobilized high-level (IHLW)	High-level waste feed that has had its constituents stabilized by an immobilization process such as vitrification.
waste, immobilized low-activity (ILAW)	Low-activity waste feed that has had its constituents stabilized by an immobilization process such as vitrification.
waste, low-activity (LAW)	Low-activity waste is mixed waste that, when sufficiently pretreated and processed, can be described as incidental waste.

waste, high-level (HLW)	High-level waste is defined by the US Nuclear Regulatory Commission (NRC) in the *Code of Federal Regulations*, 10 CFR 72.3, as: "(1) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (2) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation."

Chapter 1

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1. Introduction

Part A

The Part A, Dangerous Waste Permit Application (DWPA) Form 1, for the River Protection Project – Waste Treatment Plant (RPP-WTP) is included in the following pages. Figure 1-1 shows the location of the RPP-WTP on the Hanford Site.

The Part A, DWPA Form 3, for the RPP-WTP is included immediately after Figure 1-1.

FORM 1	Washington State DANGEROUS WASTE PERMIT GENERAL INFORMATION (Read "Form 1 Instructions" before starting)	I. EPA/State I.D. No. WA789000896 7

II. NAME OF FACILITY				
U.S. Department of Energy – Hanford Facility				
III. FACILITY CONTACT				
A. Name and Title (last, first, &title)				B. Phone (area code & no.)
Keith A. Klein, Manager				(509)376-7395
IV. FACILITY MAILING ADDRESS				
A. Street or P.O. Box				
PO Box 550				
B. City or Town			C. State	D. Zip Code
Richland			WA	99352
V. FACILITY LOCATION				
A. Street, Route No., or Other Specific Identifier				
Hanford Site				
B. County Name				
Benton				
C. City or Town		D. State	E. Zip Code	F. County Code *(if known)*
Richland		WA	99352	005
VI. SIC CODES *(4-digit, in order of priority)*				
A. First		B. Second		
9999	(specify) Nonclassifiable	4953	(specify) Refuse Systems	
C. Third		D. Fourth		
9511	(specify) Air and Water Resource and Solid Waste Management	8733	(specify) Research, Noncommercial	
VII. OPERATOR INFORMATION				B. Is the name listed in item VII-A also the owner?
A. Name				
Department of Energy*				X Yes ☐ No
BNFL Inc.**				
C. Status of Operator (Enter the appropriate letter into the answer box: if "Other " specify)				
F = Federal M = Public (other than federal or state) S = State P = Private O = Other (specify)		(specify) F		D. Phone (area code & no.) *(509) 376-7395 **(509) 371-3500
E. Street or P. O. Box				
*PO Box 550 (DOE)				
**3000 George Washington Way				
F. City or Town	G. State	H. Zip Code	VIII. INDIAN LAND Is the facility located on Indian lands?	
Richland	WA	99352	☐ Yes	X No

*DOE-RL: Land Owner

**BNFL Inc.: Owner-Operator for the RPP-WTP

IX. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area. See instructions for precise requirements.

X. NATURE OF BUSINESS *(provide a brief description)*

- Nonclassifiable - General
- Refuse Systems
- Air and Water Resource and Solid Waste Management
- Research, Noncommercial

XI. CERTIFICATION *(see instructions)*

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. Name & Official title (Type or print)	B. Signature	C. Date Signed
See attachment		

XI. OPERATOR CERTIFICATION

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.

RPP-WTP Owner/Operator
Maurice J. Bullock
Vice President, BNFL Inc.

4/25/00
Date

I certify on behalf of the Department of Energy, under penalty of law, that the Department of Energy owns the real property described herein, and I am aware of the contents of this permit application, and that I have received a copy of this application. As Manager, Richland, Operations Office, US Department of Energy, I understand that I am responsible for complying with any requirements of Chapter 173-303 WAC with which only I am able to comply, and that there are significant penalties for failure to comply with such requirements.

Land Owner
Keith A. Klein, Manager
US Department of Energy, Richland Operations Office

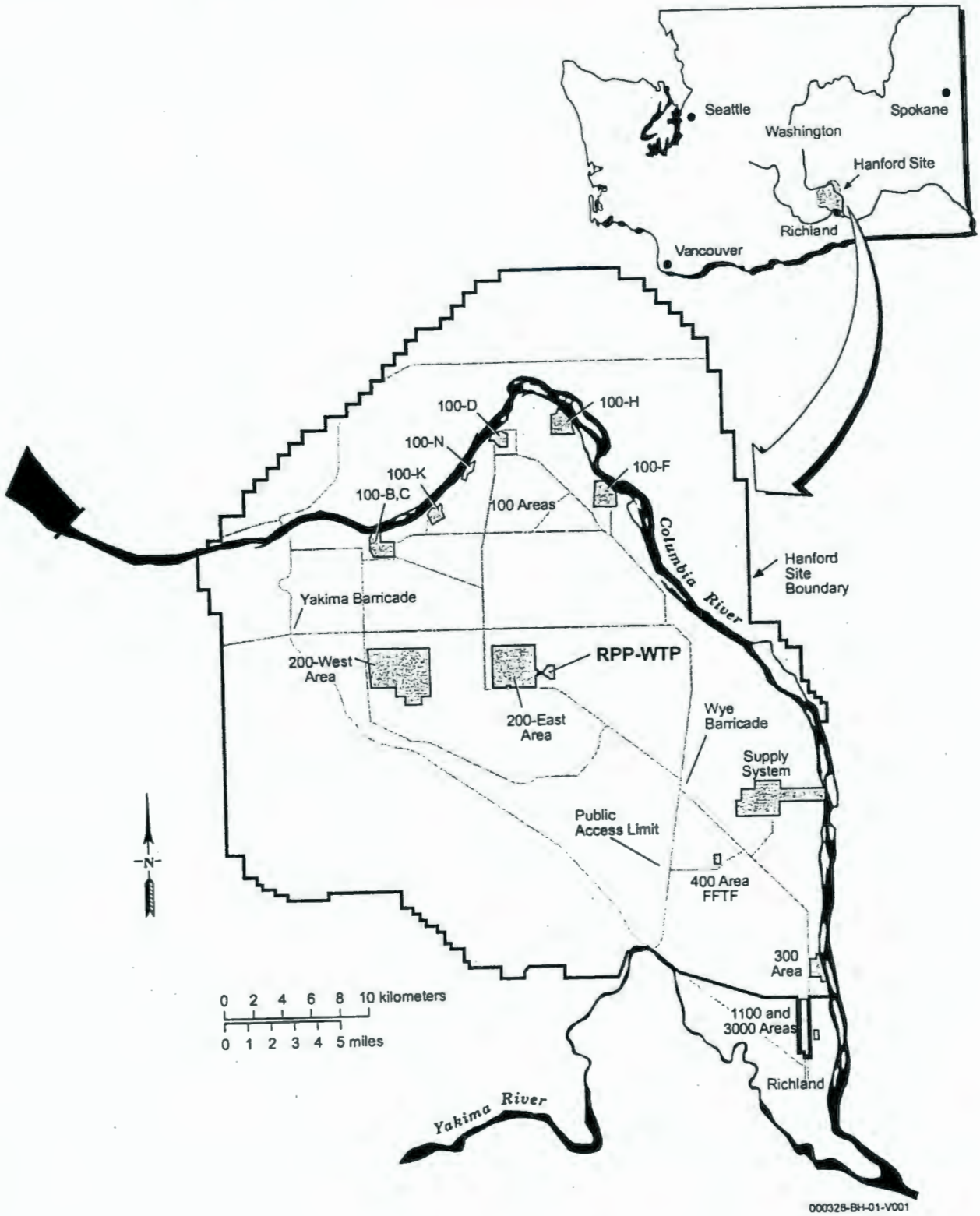
4/25/00
Date

I certify on behalf of the Department of Energy, under penalty of law, that I am the Manager of the Office of River Protection, am aware of the contents of this permit application, and that I have received a copy of this application. As Manager, Office of River Protection, US Department of Energy, I understand that I am responsible for complying with any requirements of Chapter 173-303 WAC which only I am able to comply, and that there are significant penalties for failure to comply with such requirements.

Richard T. French, Manager
US Department of Energy, Office of River Protection

4/26/00
Date

Figure 1-1. Location of the RPP-WTP on the Hanford Site



FORM **3**

DANGEROUS WASTE PERMIT APPLICATION

1. EPA/STATE I.D. NUMBER: W A 7 8 9 0 0 0 8 9 6 7

FOR OFFICIAL USE ONLY

APPLICATION APROVED	DATE RECEIVED (mo., day, & yr.)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA/STATE I.D. Number, or if this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☒ 1. EXISTING FACILITY (*See instructions for definition of "existing" facility. Complete item below.*)

MO.	DAY	YR.
3	22	43

*FOR EXISTING FACILITIES, PROVIDE THE DATE *(mo., day, & yr.)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

* The date construction of the Hanford Facility commenced.

☐ 2. NEW FACILITY (*Complete item below.*)

MO.	DAY	YR.

FOR NEW FACILITIES, PROVIDE THE DATE, *(mo., day, & yr.)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *9place an "X" below and complete Section I above)*

☒ 1. FACILITY HAS AN INTERIM STATUS PERMIT

☒ 2. FACILITY HAS A FINAL PERMIT

III. PROCESSES – CODES AND CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the codes(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the *(Section III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER (barrel, drum, etc.)	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D80	GALLONS OR LITERS
LANDFILL	D81	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D82	*ACRES OR HECTARES*
OCEAN DISPOSAL	D83	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D84	GALLONS OR LITERS

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER (Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided: Section III-C.)	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U

UNIT OF MEASURE	UNIT OF MEASURE CODE
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H

UNIT OF MEASURE	UNIT OF MEASURE CODE
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECATRES	Q

EXAMPLE FOR COMPLETING SECTION III *(shown in line numbers X-1 and X-2 below): A facility has two storage tanks; one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.*

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5	T04	774	U	
X-2	T 0 3	20	E		6				
1	S01	1,830,455	G		7				
2	S02	6,004,830	G		8				
3	T01	34,636	U		9				
4	T04	12,506	U		10				

CONTINUE ON PAGE 2

Continued from Page 1.

III. PROCESSES (continued)

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESS (code "TO4"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

Line 4 - T04 = Treatment in miscellaneous unit and containment building for immobilized waste only

Line 5 - T04 = Containment building treatment process for secondary waste only

IV. DESCRIPTION OF DANGEROUS WASTES

A. DANGEROUS WASTE NUMBER – Enter the four digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.

B. ESTIMATED ANNUAL QUANTITY - For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE - For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER - Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "Included with above" and make no other entries on that line.
3. Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

EXAMPLE FOR COMPLETING SECTION IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*				B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*			D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
X-1	*K*	*0*	*5*	*4*	*900*	*P*	*T 0 3*	*D 8 0*		
X-2	*D*	*0*	*0*	*2*	*400*	*P*	*T 0 3*	*D 8 0*		
X-3	*D*	*0*	*0*	*1*	*100*	*P*	*T 0 3*	*D 8 0*		
X-4	*D*	*0*	*0*	*2*			*T 0 3*	*D 8 0*		*included with above*

 CONTINUE ON PAGE 3A

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I. D. NUMBER *(entered from page 1)*

W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*			D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(If a code is not entered in D(1))*
1	D001	60, 369	T			S02				
2	D003					S02				Included with above
3	D002	60,369	T			T01	S02			
4	D004					T01	S02			Included with above
5	D005					T01	S02			Included with above
6	D006					T01	S02			Included with above
7	D007					T01	S02			Included with above
8	D008					T01	S02			Included with above
9	D009					T01	S02			Included with above
10	D010					T01	S02			Included with above
11	D011					T01	S02			Included with above
12	D018					T01	S02			Included with above
13	D019					T01	S02			Included with above
14	D022					T01	S02			Included with above
15	D028					T01	S02			Included with above
16	D029					T01	S02			Included with above
17	D030					T01	S02			Included with above
18	D033					T01	S02			Included with above
19	D034					T01	S02			Included with above
20	D035					T01	S02			Included with above
21	D036					T01	S02			Included with above
22	D038					T01	S02			Included with above
23	D039					T01	S02			Included with above
24	D040					T01	S02			Included with above
25	D041					T01	S02			Included with above
26	D043					T01	S02			Included with above

 CONTINUE ON PAGE 3B
(enter "A," "B," "C," etc., behind the "3" to identify photo copied pages)

Continued from page 3A.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I. D. NUMBER *(entered from page 1)*

W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*			D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
1	WT01					T01	S02			Included with above
2	WT02					T01	S02			Included with above
3	WP01					T01	S02			Included with above
4	WP02					T01	S02			Included with above
5	F001					T01	S02			Included with above
6	F002					T01	S02			Included with above
7	F003					T01	S02			Included with above
8	F004					T01	S02			Included with above
9	F005					T01	S02			Included with above
10	F039[a]					T01	S02			Included with above
11										
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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I. D. NUMBER *(entered from page 1)*

W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*			D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
1	D002	21,324	T			T04	S01			Vitrification treatment process and storage of ILAW and IHLW
2	D004					T04	S01			Included with above
3	D005					T01	S01			Included with above
4	D006					T04	S01			Included with above
5	D007					T04	S01			Included with above
6	D008					T04	S01			Included with above
7	D009					T04	S01			Included with above
8	D010					T04	S01			Included with above
9	D011					T04	S01			Included with above
10	D018					T04	S01			Included with above
11	D019					T04	S01			Included with above
12	D022					T04	S01			Included with above
13	D028					T04	S01			Included with above
14	D029					T04	S01			Included with above
15	D030					T04	S01			Included with above
16	D033					T04	S01			Included with above
17	D034					T04	S01			Included with above
18	D035					T04	S01			Included with above
19	D036					T04	S01			Included with above
20	D038					T04	S01			Included with above
21	D039					T04	S01			Included with above
22	D040					T04	S01			Included with above
23	D041					T04	S01			Included with above
24	D043					T04	S01			Included with above
25	WT01					T04	S01			Included with above
26	WT02					T04	S01			Included with above

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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I. D. NUMBER *(entered from page 1)*

W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
1	WP01			T04	S01			Included with above
2	WP02			T04	S01			Included with above
3	F001			T04	S01			Included with above
4	F002			T04	S01			Included with above
5	F003			T04	S01			Included with above
6	F004			T04	S01			Included with above
7	F005			T04	S01			Included with above
8	F039			T04	S02			Included with above
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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I. D. NUMBER *(entered from page 1)*

W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*			D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
1	D002	841	T			T04	S01			Treatment and storage of secondary waste
2	D004					T04	S01			Included with above
3	D005					T01	S01			Included with above
4	D006					T04	S01			Included with above
5	D007					T04	S01			Included with above
6	D008					T04	S01			Included with above
7	D009					T04	S01			Included with above
8	D010					T04	S01			Included with above
9	D011					T04	S01			Included with above
10	D018					T04	S01			Included with above
11	D019					T04	S01			Included with above
12	D022					T04	S01			Included with above
13	D028					T04	S01			Included with above
14	D029					T04	S01			Included with above
15	D030					T04	S01			Included with above
16	D033					T04	S01			Included with above
17	D034					T04	S01			Included with above
18	D035					T04	S01			Included with above
19	D036					T04	S01			Included with above
20	D038					T04	S01			Included with above
21	D039					T04	S01			Included with above
22	D040					T04	S01			Included with above
23	D041					T04	S01			Included with above
24	D043					T04	S01			Included with above
25	WT01					T04	S01			Included with above
26	WT02					T04	S01			Included with above

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Continued from page 3E.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

I. D. NUMBER *(entered from page 1)*

W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
1	WP01			T04	S01			Included with above
2	WP02			T04	S01			Included with above
3	F001			T04	S01			Included with above
4	F002			T04	S01			Included with above
5	F003			T04	S01			Included with above
6	F004			T04	S01			Included with above
7	F005			T04	S01			Included with above
8	F039			T04	S02			Included with above
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(enter "A," "B," "C," etc., behind the "3" to identify photo copied pages)

Continued from Page 3F

IV. DESCRIPTION OF DANGEROUS WASTE (continued)

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM SECTION D(1) ON PAGE 3.

[a]Multisource leachate is included as a waste derived from non-specific source wastes F001 through F005.

V. FACILITY DRAWING See Figures 1-1 and 1-2

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS See Figure 1-3

All existing facilities must include photographs *(aerial or ground-level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*			LONGITUDE *(degrees, minutes, & seconds)*		
46	33	07	119	30	23

VIII. FACILITY OWNER

A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information," place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
See Form 3, page 5 of 5	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME *(print or type)*	SIGNATURE	DATE SIGNED
See Form 3, page 5 of 5		

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME *(print or type)*	SIGNATURE	DATE SIGNED
See Form 3, page 5 of 5		

 CONTINUE ON PAGE 5

VIII. FACILITY LEGAL OWNER

Land Owner: US Department of Energy
Richland Operations Office
P. O. Box 550
Richland, WA 99352
(509) 372-7395

RPP-WTP Owner/Operator: BNFL Inc.
3000 George Washington Way
Richland, WA 99352
(509) 371-3100

IX and X. OWNER AND OPERATOR CERTIFICATION

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.

RPP-WTP Owner/Operator
Maurice J. Bullock
Vice President, BNFL Inc.

Date 4/25/00

I certify on behalf of the Department of Energy, under penalty of law, that the Department of Energy owns the real property described herein, and I am aware of the contents of this permit application, and that I have received a copy of this application. As Manager, Richland Operations Office, US Department of Energy, I understand that I am responsible for complying with any requirements of Chapter 173-303 WAC with which only I am able to comply, and that there are significant penalties for failure to comply with such requirements.

Land Owner
Keith A. Klein, Manager
US Department of Energy, Richland Operations Office

Date 4/25/00

I certify on behalf of the Department of Energy, under penalty of law, that I am the Manager of the Office of River Protection, am aware of the contents of this permit application, and that I have received a copy of this application. As Manager, Office of River Protection, US Department of Energy, I understand that I am responsible for complying with any requirements of Chapter 173-303 WAC which only I am able to comply, and that there are significant penalties for failure to comply with such requirements.

Richard T. French, Manager
US Department of Energy, Office of River Protection

Date 4/26/00

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Figure 1-2. Site Layout Plan for the RPP-WTP

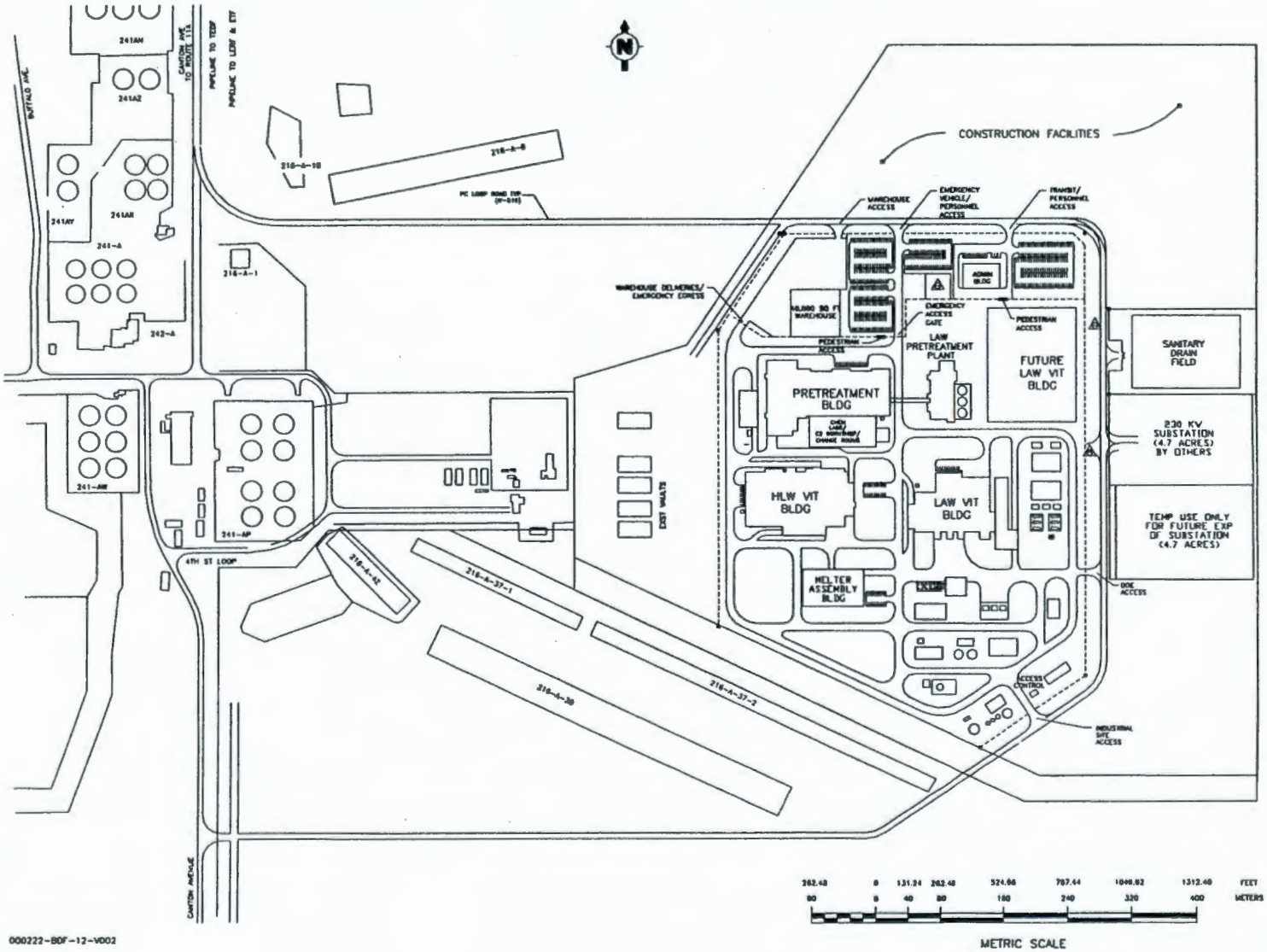
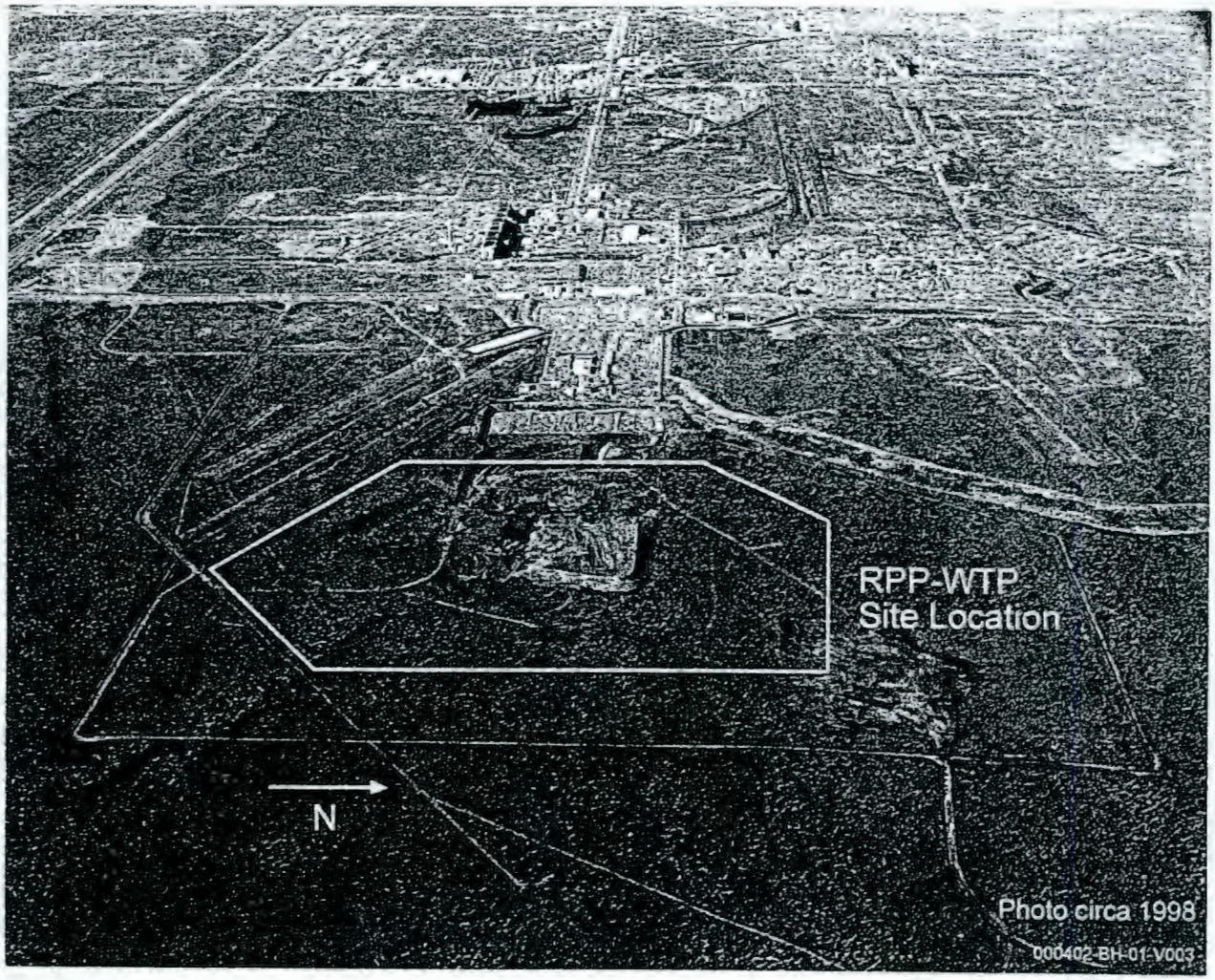


Figure 1-3. Aerial Photograph of the RPP-WTP Location



Chapter 2

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2. Facility Description and General Provisions [B]

This chapter provides an overview of the River Protection Project-Waste Treatment Plant (RPP-WTP) facility and its operations. The RPP-WTP dangerous waste permit application is being prepared as a chapter to the dangerous waste portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste Permit Number WA7890008967.

2.1. General Description [B-1]

The RPP-WTP is a new treatment and storage facility being designed by a team of private companies led by BNFL Inc. The RPP-WTP will be constructed, permitted, and operated to store and treat radioactively contaminated dangerous waste, called mixed waste, stored at the US Department of Energy, Richland Operations Office (DOE-RL) Hanford Site. The waste to be treated in the RPP-WTP is consistent with the definition of "radioactive high-level waste" (10 CFR 72.3) and dangerous waste per Washington State regulation (WAC 173-303).

The RPP-WTP will receive waste from the double-shell tank (DST) system unit in batches that are composed of either low-activity waste (LAW) feed or high-level waste (HLW) feed. The LAW and HLW feed will be transferred by pipeline to the RPP-WTP for pretreatment and immobilization by vitrification. The vitrification process will combine the pretreated tank waste with glass-forming materials and melt the mixture into a liquid that is poured into stainless steel containers. After the hot glass cools and hardens, each container is closed in preparation for storage and permanent disposal. The dangerous waste and radioactive constituents will be destroyed, removed, or immobilized in this durable glass matrix through the vitrification process.

2.1.1. Facility Description [B-1a(1) and (2)]

The RPP-WTP will be a newly constructed facility on Hanford Site property owned by the U.S. Department of Energy. DOE-RL is leasing 48 hectares (120 acres) to BNFL Inc. for construction and operation of the RPP-WTP. The leased land lies at the eastern end of the 200 East Area of the Hanford Site. Figure 2-1 shows the RPP-WTP site plot plan relative to the Hanford 200 East Tank Farms.

The owner of the land, and the owner and operator of the RPP-WTP, are as follows:

Land Owner:	US Department of Energy
Address:	US Department of Energy, Richland Operations Office Post Office Box 550 Richland, WA 99352
Telephone:	(509) 372-7395
Manager, DOE Richland Operations Office:	Mr. Keith A. Klein

RPP-WTP Owner/Operator:	BNFL Inc.
Address:	BNFL Inc. 3000 George Washington Way Richland, WA 99352
Telephone:	(509) 371-3500
BNFL Inc. Vice President:	Mr. Maurice J. Bullock

Waste will be transferred from the DST system unit in batches via an underground pipeline to the RPP-WTP waste receipt tanks. After the waste is received, it will be analyzed for selected parameters before pretreatment. Pretreatment of the LAW feed will include processes for reducing the volume of waste fed to the LAW treatment system (via evaporation), and for removing strontium (Sr), transuranic (TRU) compounds, entrained solids, cesium (Cs), and technetium (Tc) from the feed. These removed constituents will be either incorporated into the HLW melter feed or transferred to an appropriate treatment, storage, or disposal (TSD) facility. Pretreatment of the HLW feed includes processes to concentrate the HLW feed and add constituents that are removed from the LAW feed. Figure 2-2 contains a simplified block flow diagram of the waste treatment processes.

After the LAW and HLW waste feed streams are pretreated, two vitrification systems will be used in the RPP-WTP. One system will immobilize the pretreated LAW feed, and the other system will immobilize the pretreated HLW feed. The immobilized low-activity waste (ILAW) and immobilized high-level waste (IHLW) produced by the RPP-WTP will be in the form of glass sealed in steel containers. The RPP-WTP will also treat the offgas from receipt tanks, pretreatment systems, and vitrification systems to ensure safe levels of air emissions from the plants.

The various pretreatment, vitrification, and offgas treatment processes generate miscellaneous wastes, such as used equipment, lab waste, and other chemically and radiologically contaminated materials. (These "newly generated wastes" are referred to as "miscellaneous wastes" and "secondary wastes".) Secondary waste will be transferred elsewhere in the RPP-WTP, transferred to TSD facilities located on the Hanford Site, or transferred off the Hanford Site as appropriate. Nonradioactive dangerous waste may also be generated by laboratory and maintenance activities. This waste will be managed at the RPP-WTP until it can be transferred to a TSD facility.

The RPP-WTP will be designed to provide for possible future enhancements to the LAW vitrification throughput. These enhancements may include construction and operation of an additional LAW vitrification building in the future. Although the structure is not part of this dangerous waste permit application, a potential location for it is depicted in Figure 2-1.

2.1.2. Description of Dangerous Waste Management Operations and Processes [B-1a(2)]

The RPP-WTP will store and treat HLW and LAW feed from the Hanford Site DST system unit. The term LAW feed generally refers to the supernatant portion of the DST system unit waste. LAW feed is comprised of three waste feed envelopes, which are described as follows:

- Envelope A. This LAW feed envelope will contain cesium and technetium at concentrations high enough to warrant removal of these radionuclides during pretreatment, in order to ensure that the ILAW glass waste meets applicable requirements.

- Envelope B. This LAW feed envelope will contain higher concentrations of cesium than Envelope A. Both cesium and technetium must be removed to comply with the ILAW specifications. This envelope will also contain concentrations of chlorine, chromium, fluorine, phosphates and sulfates that are higher than those found in Envelope A, which may limit the waste incorporation rate into the glass.

- Envelope C. This LAW feed envelope will contain organic compounds complexed with strontium and transuranics (TRU) that will require removal in a processing step unique to this waste envelope. As with Envelopes A and B, cesium and technetium will also require removal in the pretreatment process to ensure that ILAW glass waste meets applicable requirements.

The HLW feed will be in the form of a slurry containing approximately 10 to 200 grams of unwashed solids per liter. The liquid fraction of the slurry will be comprised of Envelope A, B, or C waste and the solid fraction will be Envelope D waste.

The RPP-WTP treatment processes will be designed to immobilize the waste constituents in a glass matrix by vitrification, and to treat the offgas from the processes to a level that protects human health and the environment.

Two similarly designed vitrification systems will be used in the RPP-WTP. One system will immobilize the pretreated LAW feed, and the second will immobilize the pretreated HLW feed. The dangerous waste constituents in the melter feed will be destroyed, removed or immobilized in a glass matrix through the vitrification process. The ILAW and IHLW produced by the RPP-WTP will be in the form of glass sealed in steel containers and placed in permitted (TSD) facilities.

Secondary waste streams (for example, radioactive and dangerous solid waste, nonradioactive and nondangerous liquid effluents, and radioactive and dangerous liquid effluents) will be characterized and recycled into the treatment process, transported to permitted TSD facilities located on the Hanford Site, or transported offsite as appropriate. Nonradioactive dangerous waste may also be generated by laboratory and maintenance activities. This waste will be managed at the RPP-WTP until it can be transferred to an offsite permitted TSD facility.

There are four primary components of the process at the RPP-WTP: pretreatment, LAW pretreatment, LAW vitrification, and HLW vitrification. In addition, each of these waste treatment processes is supported by systems and utilities known as the balance of facility (BOF). The following discussion presents an overview of these waste treatment processes and BOF systems at the RPP-WTP. Figures 2- 3 through 2-19 show waste management areas within the plants.

Pretreatment and LAW Pretreatment

The LAW feeds will be stored and subsequently treated in the pretreatment and LAW pretreatment plants prior to vitrification. Pretreatment of the LAW feed will occur in the pretreatment and the LAW pretreatment plants. The processes in these two plants will reduce the volume of LAW feed and remove cesium, technetium, strontium, TRU compounds, and entrained solids. Pretreatment of the HLW will occur in the pretreatment plant. The HLW feed will be processed through ultrafiltration to concentrate the solids. The permeate (liquid portion) from the ultrafiltration unit will be treated as LAW feed.

Three types of waste management units in the pretreatment plant and LAW pretreatment plant will be as follows:

- Container storage areas
- Storage and treatment tanks
- Containment building units (for LAW pretreatment plant only)

The structures of the pretreatment and LAW pretreatment plants will be supported by a reinforced concrete foundation. The superstructure will be made of structural steelwork with a metal roof. Typically, the process cells within the pretreatment and LAW pretreatment plants will be constructed of reinforced concrete to protect facility operators from radiation. The cell floors and a portion of the cell walls will be lined with stainless steel to provide secondary containment for the process tanks.

LAW Vitrification

The LAW vitrification plant will house the vitrification systems for production of the ILAW. Four types of waste management units will be located in the LAW vitrification plant, as follows:

- Container storage areas
- Storage and treatment tanks
- Miscellaneous treatment units (the LAW melters)
- Containment building units

The LAW vitrification plant building will be constructed of reinforced concrete and structural steelwork. The below grade portion of the building structure will be made of reinforced concrete construction, and the superstructure will be made of reinforced concrete and structural steelwork with a metal roof. The plant structure will be supported by a reinforced concrete mat foundation. A protective coating will be applied to the concrete floor and walls of the LAW melter gallery. The process rooms, which house mixed waste tanks, and the melter pour cave will be lined (at least partially) with stainless steel.

HLW Vitrification

The HLW vitrification plant will house the vitrification systems for producing IHLW. Four types of waste management units will be located in the HLW vitrification plant, as follows:

- Container storage areas
- Treatment tanks
- Miscellaneous treatment unit (the HLW melter)
- Containment building units

The HLW vitrification plant will be constructed of reinforced concrete and structural steelwork. The below grade portion of the building structure will be of reinforced concrete construction, and the superstructure will be made of structural steelwork with a metal roof. The plant structure will be supported by a reinforced concrete mat foundation. The cell and cave floors and a portion of the cell and cave walls will be lined with stainless steel to provide secondary containment for the process tanks.

Balance of Facility

The BOF will include support systems and utilities required for the waste treatment processes within the four main process areas (pretreatment, LAW pretreatment, LAW vitrification, and HLW vitrification). The BOF support systems and utilities will include, but not be limited to, heating and cooling, process steam, process water, chilled water, and compressed air.

2.1.3. Other Processes Regulated Under the Dangerous Waste Regulations [B-1a(3)]

The RPP-WTP will not perform organic solvent recycling activities.

The RPP-WTP laboratory may perform treatment-by-generator and permit-by-rule activities, such as elementary neutralization and solidification of secondary waste.

2.1.4. Other Environmental Permits [B-1a(4)]

Hanford Site TSD units are required to comply with applicable environmental laws and regulations, in addition to the Federal *Resource Conservation and Recovery Act of 1976* (RCRA 1976) and Washington's *Hazardous Waste Management Act* (Ecology 1985). The RPP-WTP will require approvals or permits related to radioactive air emissions (both state and federal), toxic air emissions, and wastewater discharges. The RPP-WTP implements the preferred alternative from the *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement* (DOE/EIS-0189) (DOE 1996). An updated *State Environmental Policy Act* (SEPA) (BNFL 2000a) checklist is provided as Supplement 12 of this application. A *Notice of Intent* (NOI) (BNFL-TWP-SER-001) (BNFL 998a) has been completed. Please see Chapter 13 of this permit application for details on other environmental permits.

2.1.5. Construction Schedule [B-1b]

The construction schedule information is found in Supplement 8.

2.2. Topographic Map [B-2]

Appendix 2A contains the RPP-WTP topographic map. A topographic map for the entire Hanford Site is provided in the *Hanford Facility Dangerous Waste Permit Application, General Information Portion* (DOE-RL 1998).

2.2.1. General Requirements [B-2a]

There are no intermediate streams on or in the immediate vicinity of the RPP-WTP Site. There will be culverts under roads and ditches to allow for drainage, and to control run-off.

Waste management operations, buildings, and structures are described in detail in Chapter 4. General information requirements for the Hanford Site are provided in the *Hanford Facility Dangerous Waste Permit Application, General Information Portion* and include indication of the 100-year flood plain area, surrounding land uses, and prevailing winds. The RPP-WTP is not located in the 100-year flood plain, and there are no surface waters in the immediate vicinity. Waste management units will be located within enclosed structures to prevent the possibility of storm water contacting dangerous waste with the exception of three process condensate tanks that are located outside, adjacent to the LAW pretreatment plant. These

outside tanks will manage dangerous waste only. All tanks will be operated in a manner to protect human health and the environment. Process pipelines used for returning waste to other Hanford Site TSD facilities will be placed within designated waste pipeline corridors.

2.2.2. Additional Requirements for Land Disposal Facilities [B-2b]

No land disposal facilities (that is, landfills, surface impoundments, waste piles, injection wells, land treatment facilities, salt domes or salt beds, underground mines or caves, concrete vaults, or bunkers) are associated with the RPP-WTP Site; therefore, this Section [B-2b] is not applicable.

2.3. Seismic Considerations [B-3]

As discussed in the *Hanford Facility Dangerous Waste Permit Application, General Information Portion*, the seismic risk zone for the Hanford Site is classified as 2B. The RPP-WTP design will meet or exceed seismic zone 2B requirements in the Uniform Building Code (UBC 1997). Additional information is located in Supplement 4's, *Seismic Analysis and Design Approach* (RPT-W375-RU00005) (BNFL 1999d).

2.4. Traffic Information [B-4]

Information concerning the traffic patterns within the RPP-WTP Site boundary is provided in this section. Information about traffic within the Hanford Site is described in the *Hanford Facility Dangerous Waste Permit Application, General Information Portion*.

Traffic will enter the RPP-WTP Site from the north and south via the existing Hanford Site roads. The topographic map in Appendix 2A depicts the Hanford Site access roads to the RPP-WTP. The south entrance will be used primarily for operations' personnel access. Heavy load traffic will be routed to the RPP-WTP Site through the north access. Vehicle access to the Hanford Site is controlled at the Hanford barricades. From the Wye barricade, access to the RPP-WTP Site from the south is made by travelling north on Route 4 South to Canton Avenue, to PC Loop Road. Access to the site from the north is made by travelling on Route 2 South from the Yakima Barricade, then west on Route 11A to Canton Avenue, then south on Canton Avenue to PC Loop Road to the RPP-WTP facility.

The majority of vehicles will enter the RPP-WTP facility from the south. Heavy load vehicles will primarily be routed through the north access. Load-bearing capacity for the secondary roads will conform to Washington State Department of Transportation (WSDOT) (WSDOT 1997) and American Association of State Highway and Transportation Officials (AASHTO) (AASHTO 2000) guidelines.

Traffic control signs will be installed at essential intersections of RPP-WTP Site access roads to control the flow of traffic. "One-way" signs will be installed to control the traffic direction in the loading area for the HLW and LAW vitrification buildings and the pretreatment building. Road layout and geometric design will conform to WSDOT M 21-01 (WSDOT 1997), M 22-01 (WSDOT 1998), and AASHTO guidelines.

The RPP-WTP plant roads and parking areas will be paved with hot mix asphalt concrete over an aggregate base course. As the design of the RPP-WTP progresses, additional traffic-related information will be provided in this section, including the following:

- Traffic patterns on site
- Estimated volumes of traffic including the number and types of vehicles that travel on site
- Traffic control signs, signals, and procedures

- Adequacy of access and on-site roads, including road surfacing and load bearing capacity
- Load bearing capacity of load/unload areas
- Designate which areas on-site are asphalt and which are concrete

Figure 2-1. Site Layout Plan for the RPP-WTP

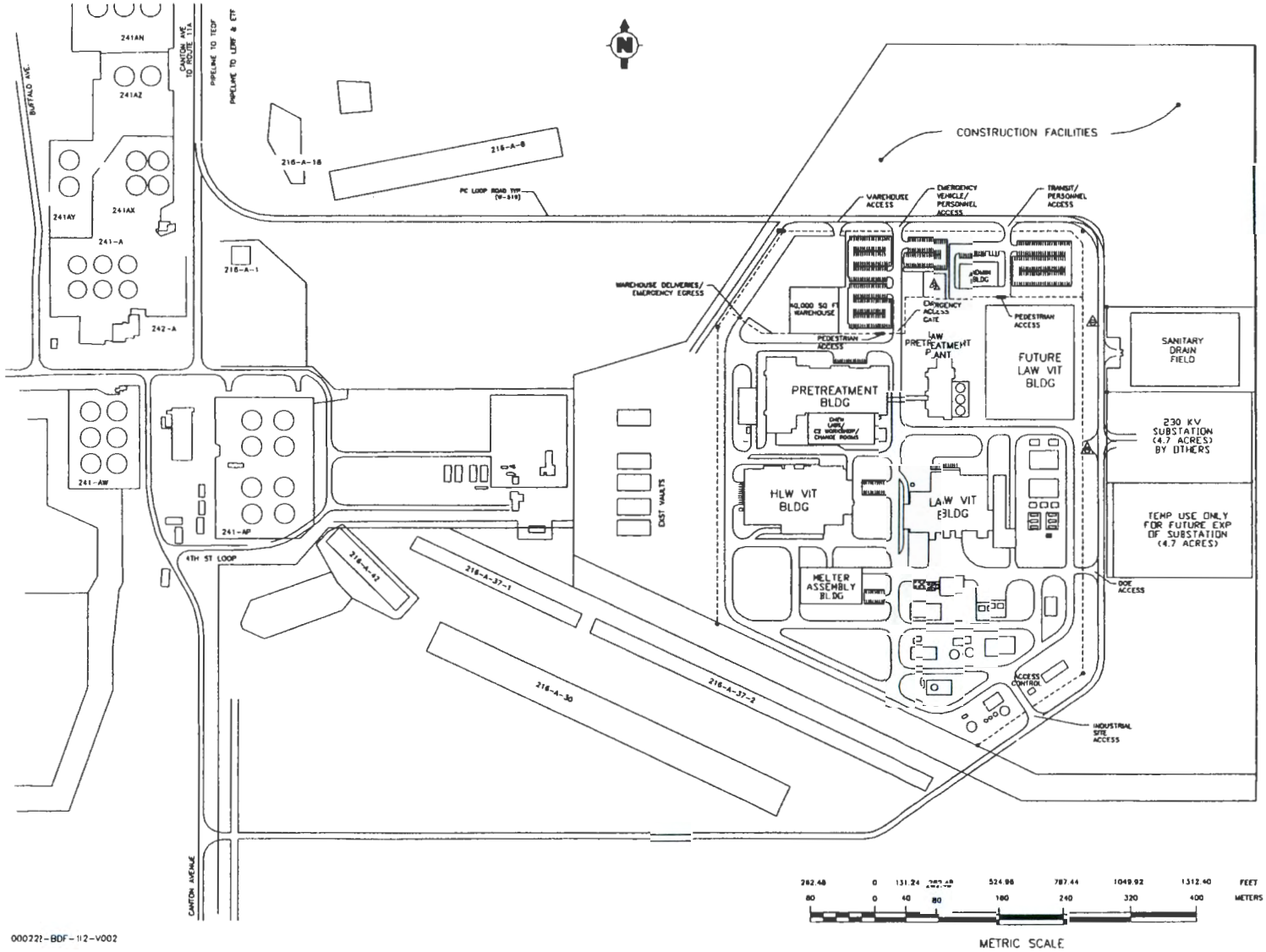


Figure 2-2. RPP-WTP – Simplified Process Flow Diagram

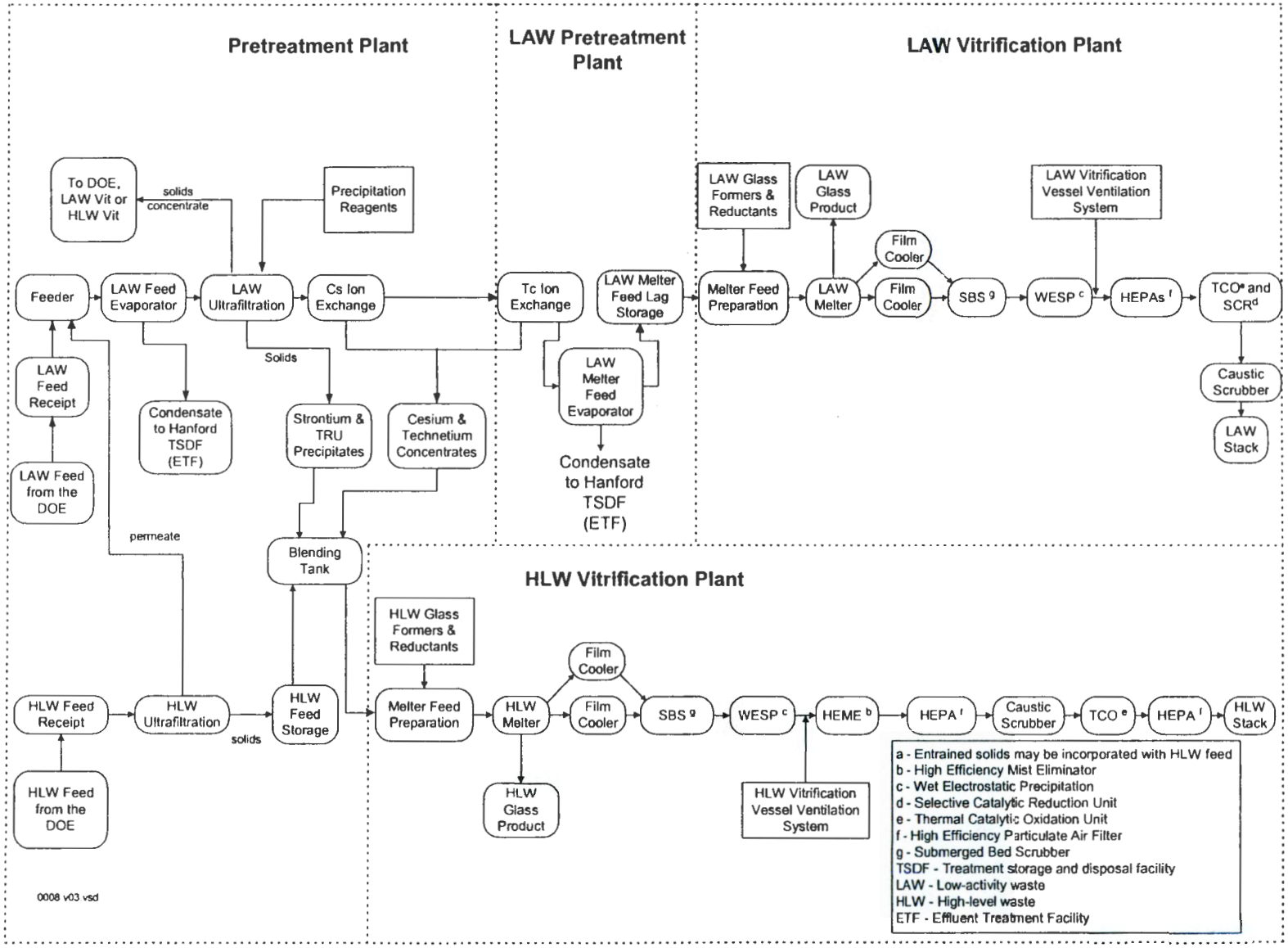


Figure 2-3. Site Layout Showing Stand-Alone Waste Management Units

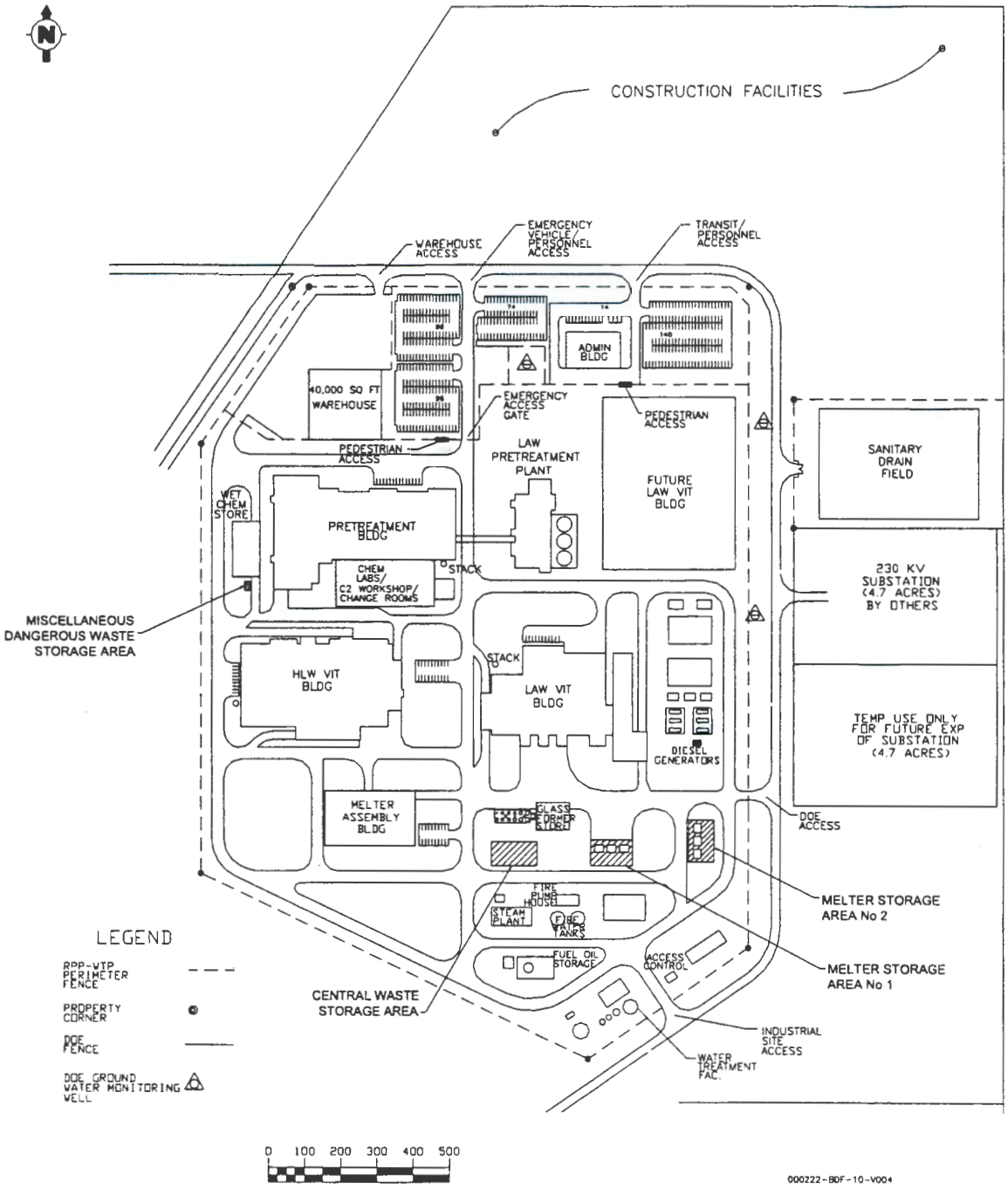


Figure 2-4. Pretreatment Plant (Elevation -50')

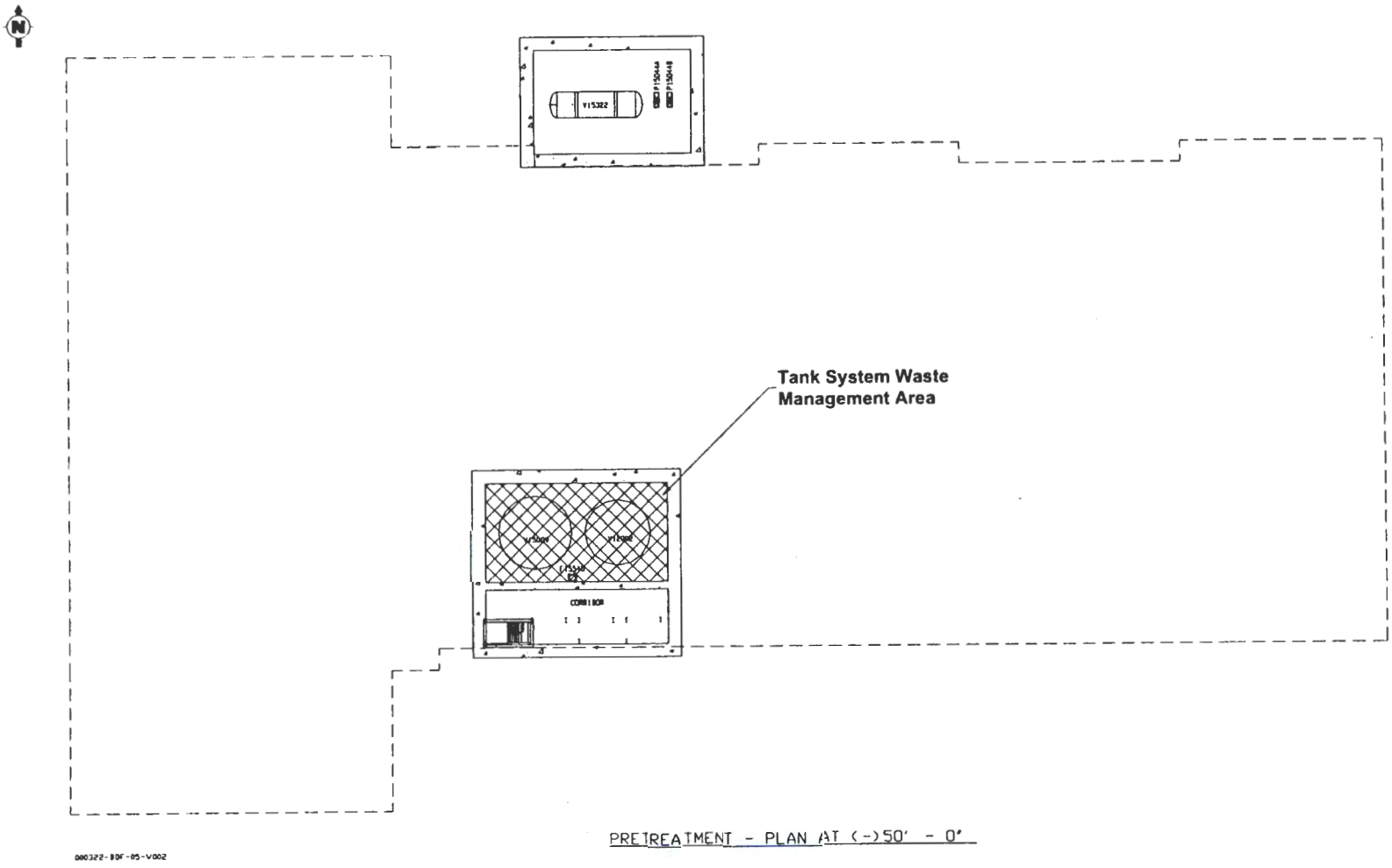


Figure 2-5. Pretreatment Plant (Elevation 0')

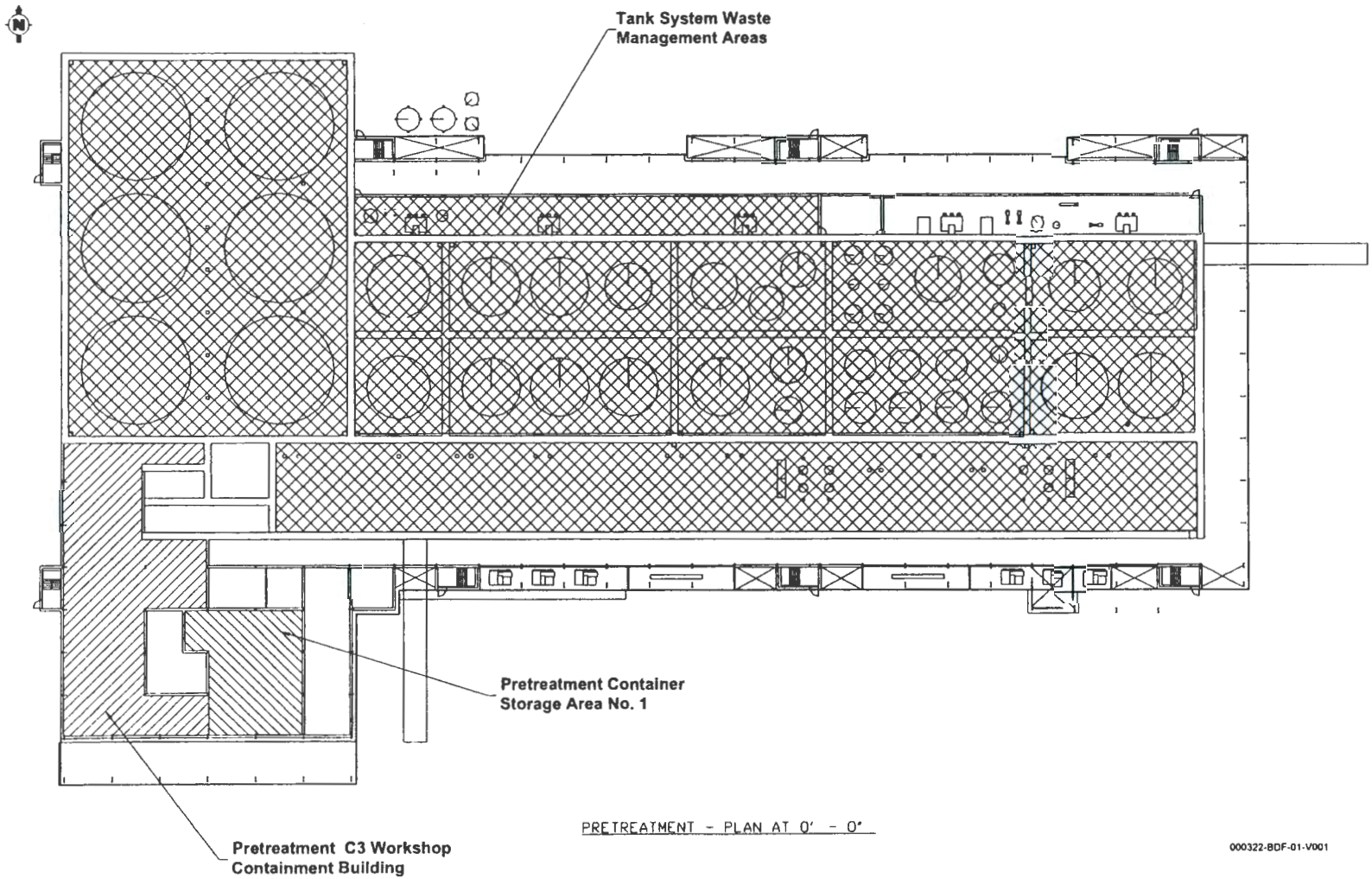


Figure 2-6. Pretreatment Plant (Elevation 20')

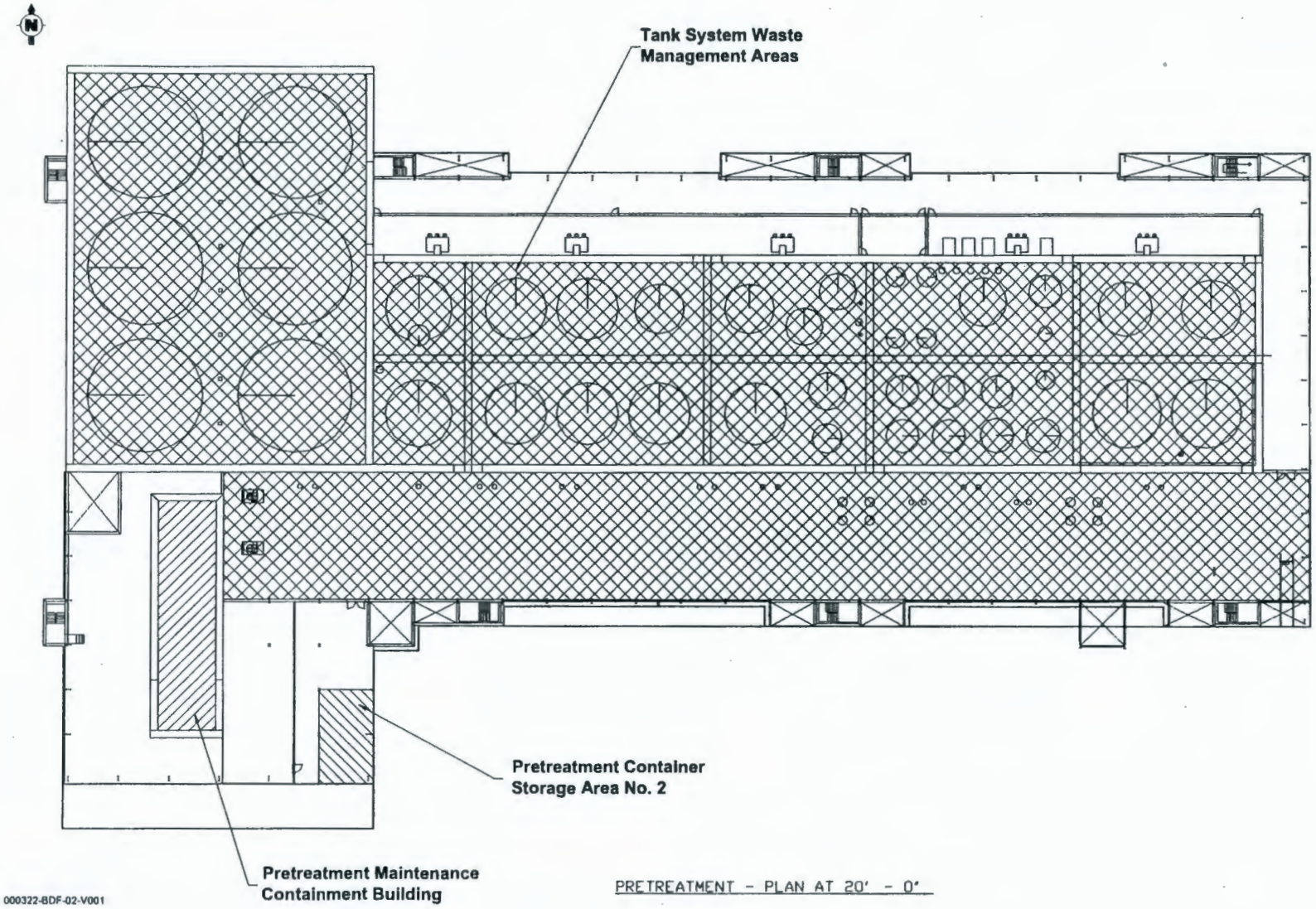


Figure 2-7. Pretreatment Plant (Elevation 56')

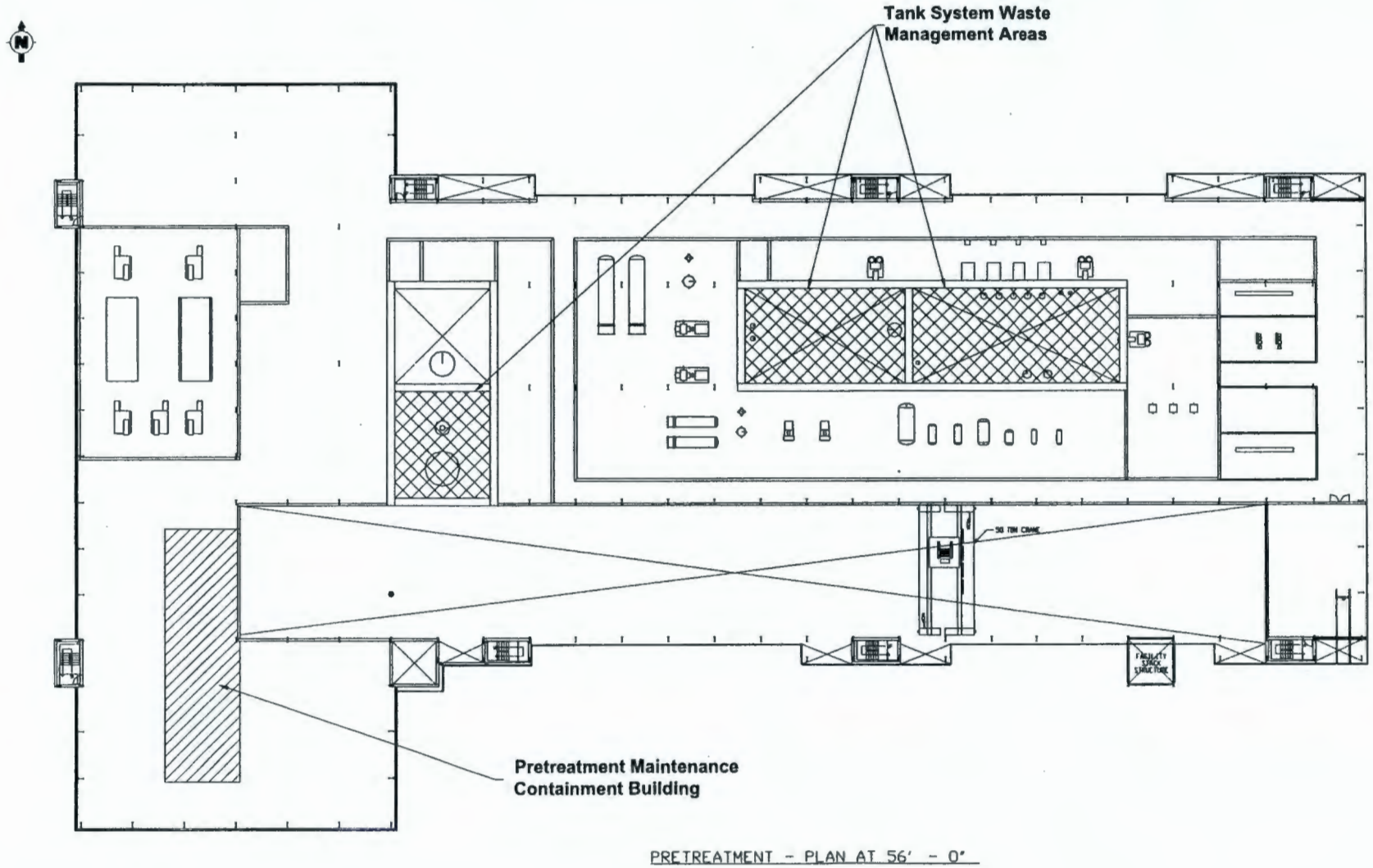
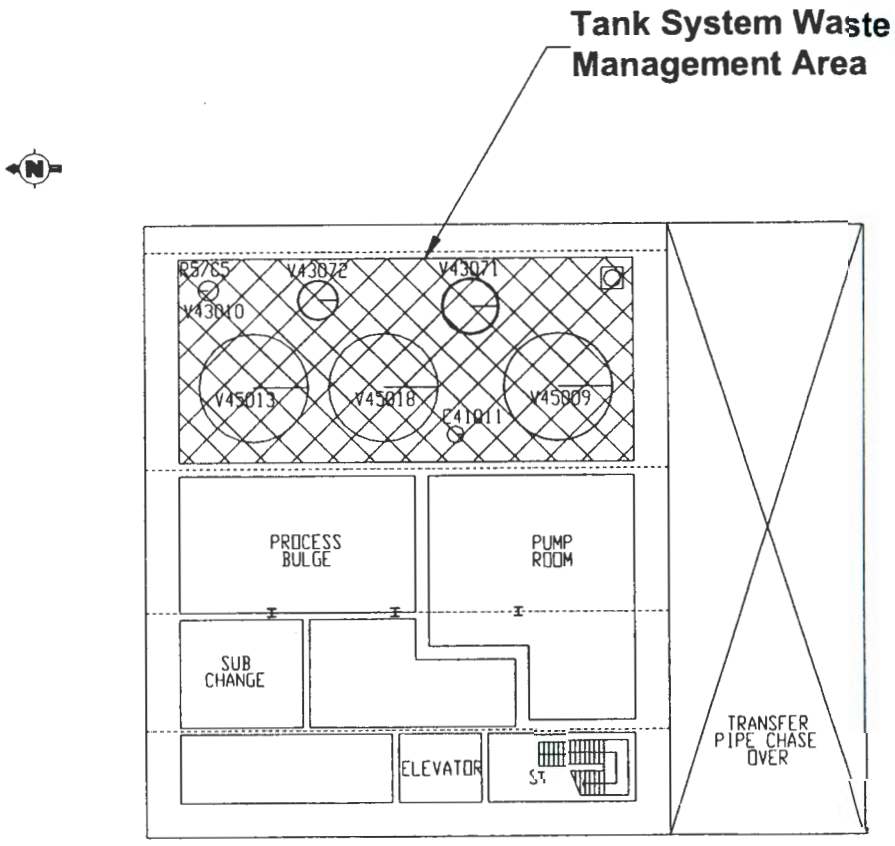


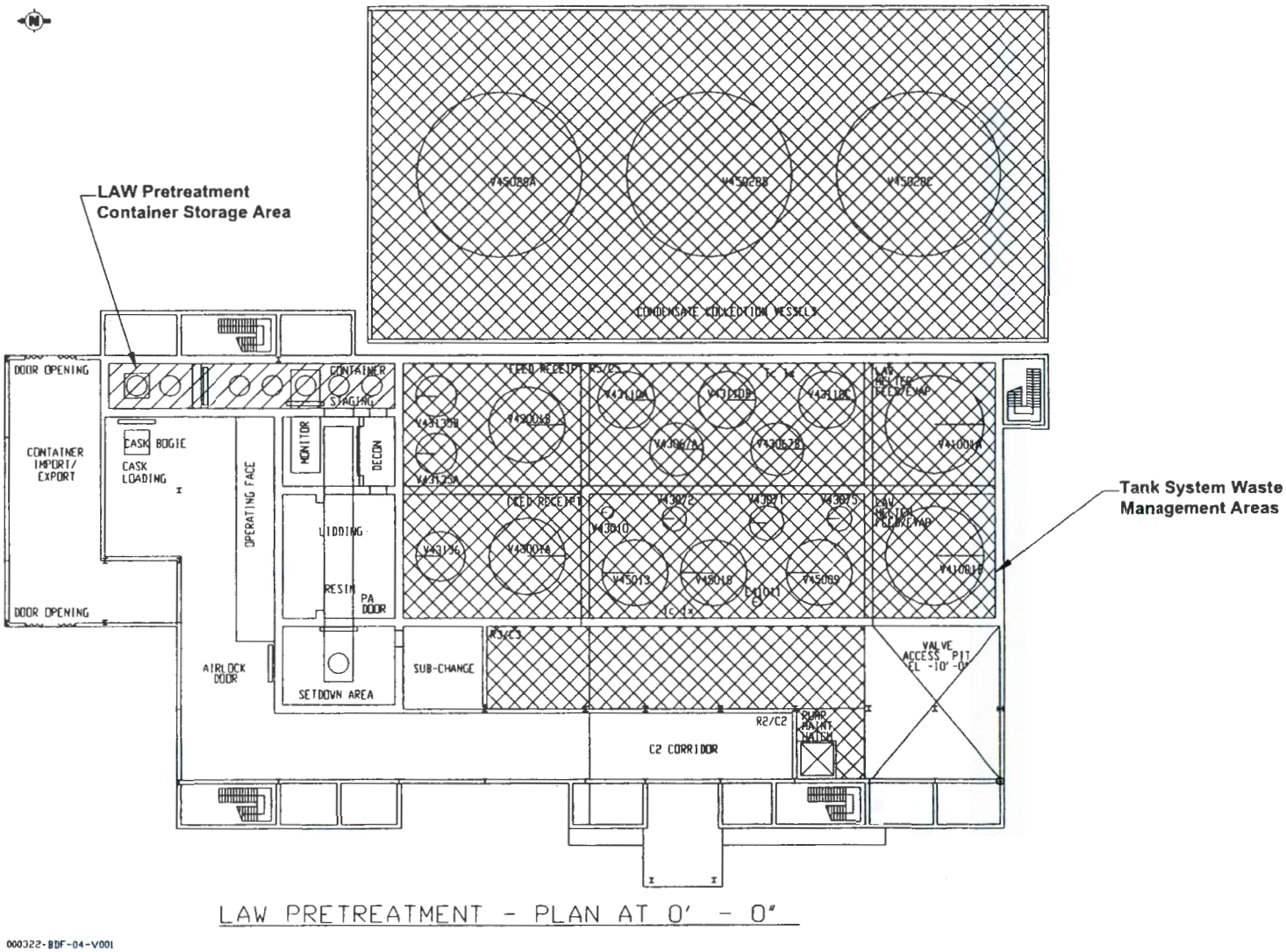
Figure 2-8. LAW Pretreatment Plant (Elevation -30')



LAW PRETREATMENT - PLAN AT -30' - 0"

000316-BDF-11-V002

Figure 2-9. LAW Pretreatment Plant (Elevation 0')



000322-BDF-04-V001

Figure 2-10. LAW Pretreatment Plant (Elevation 25')

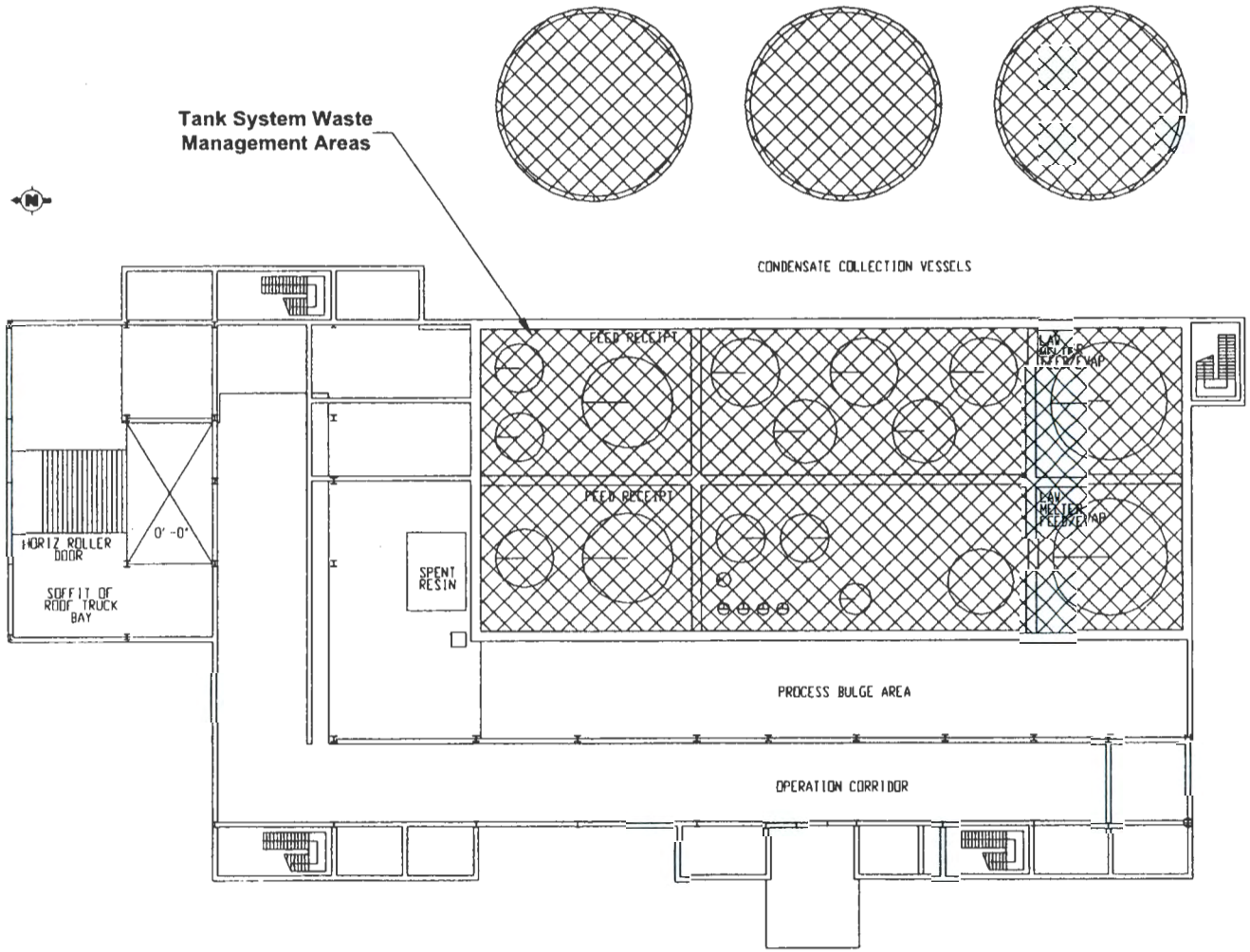
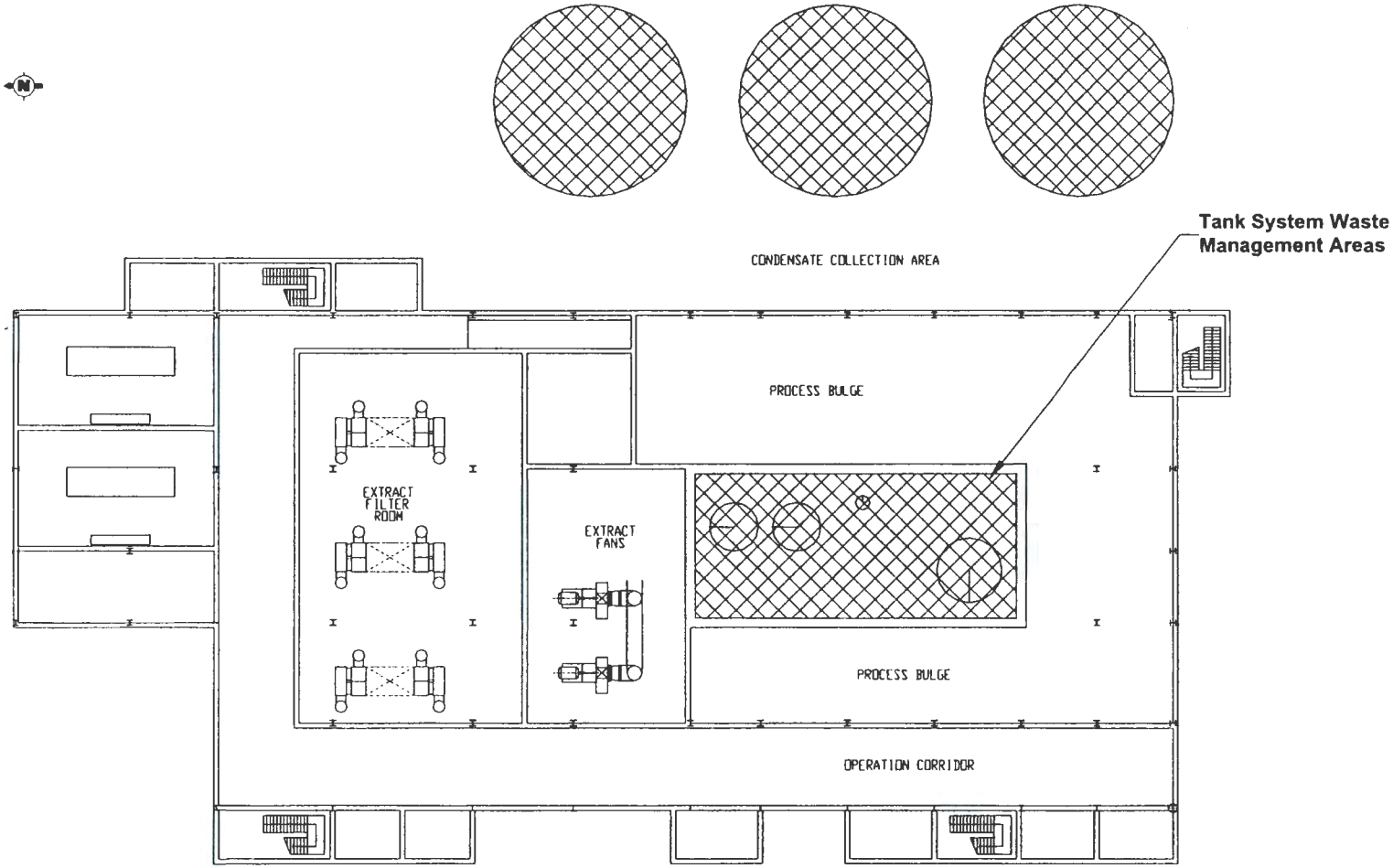


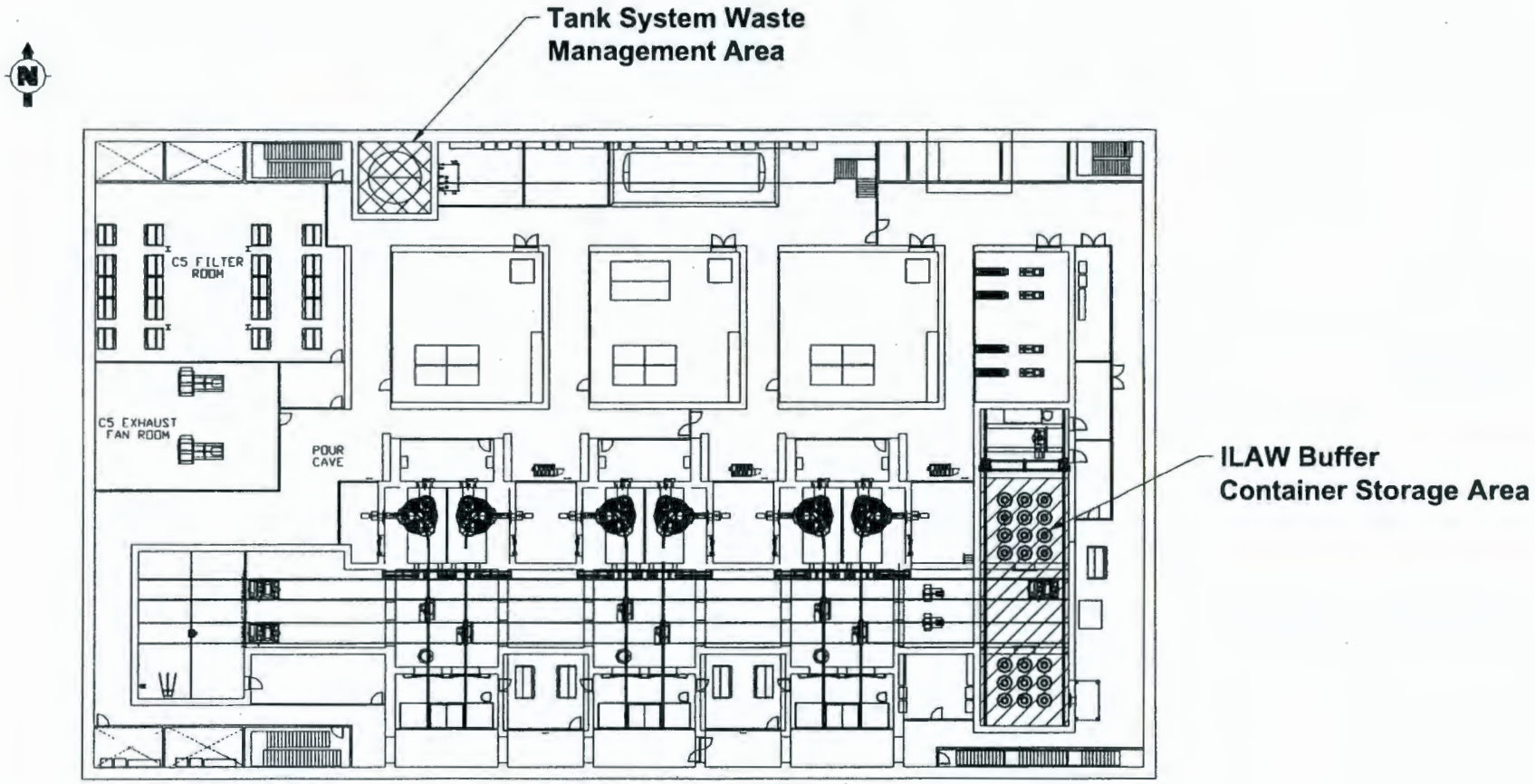
Figure 2-11. LAW Pretreatment Plant (Elevation 55')



LAW PRETREATMENT - PLAN AT 55' - 0"

000316-BDF-14-V002

Figure 2-12. LAW Vitrification Plant (Elevation -21')



000323-BDF-01-V001

Figure 2-13. LAW Vitrification Plant (Elevation 3')

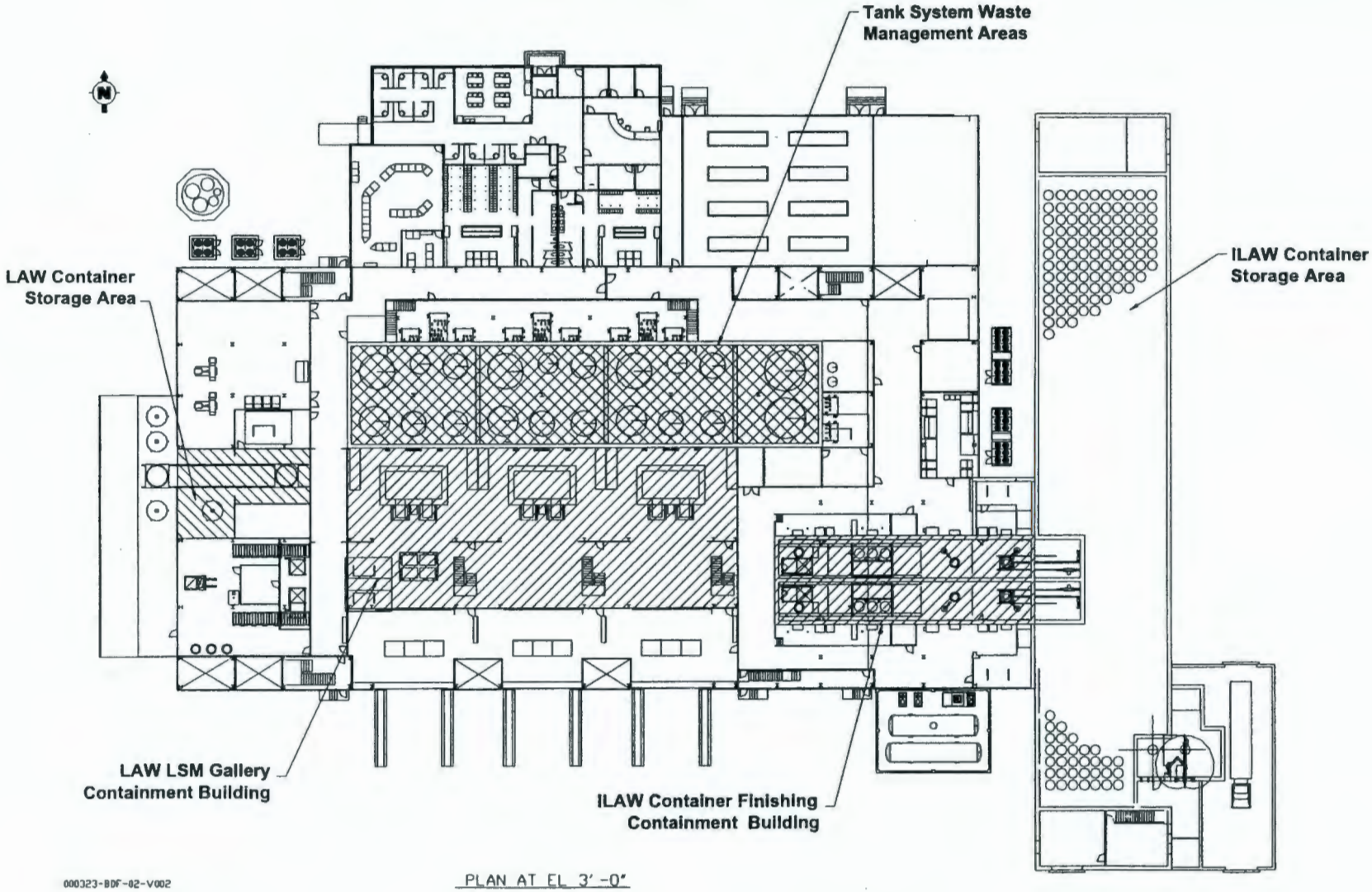


Figure 2-14. LAW Vitrification Plant (Elevation 19'-3")

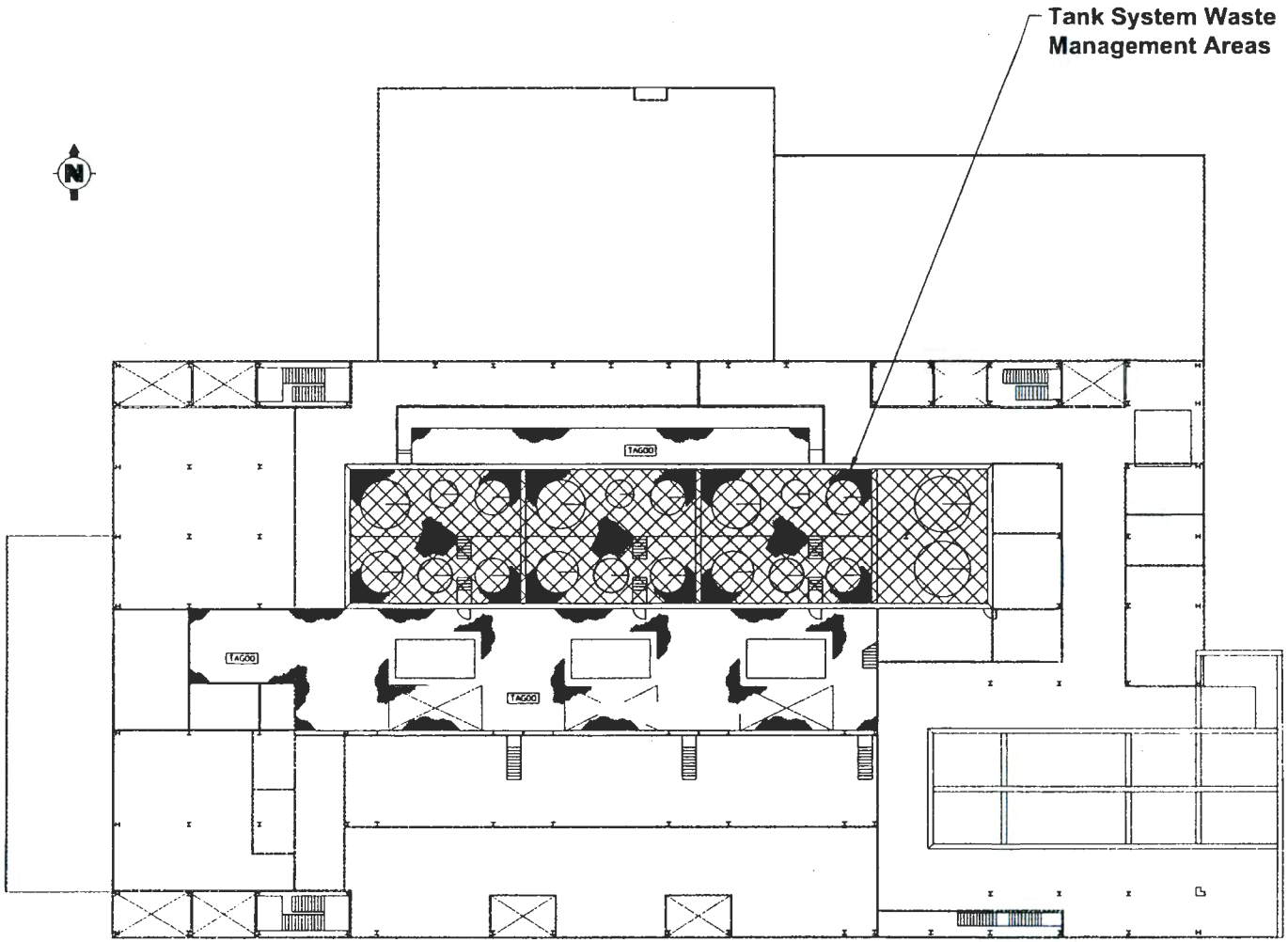


Figure 2-15. LAW Vitrification Plant (Elevation 28')

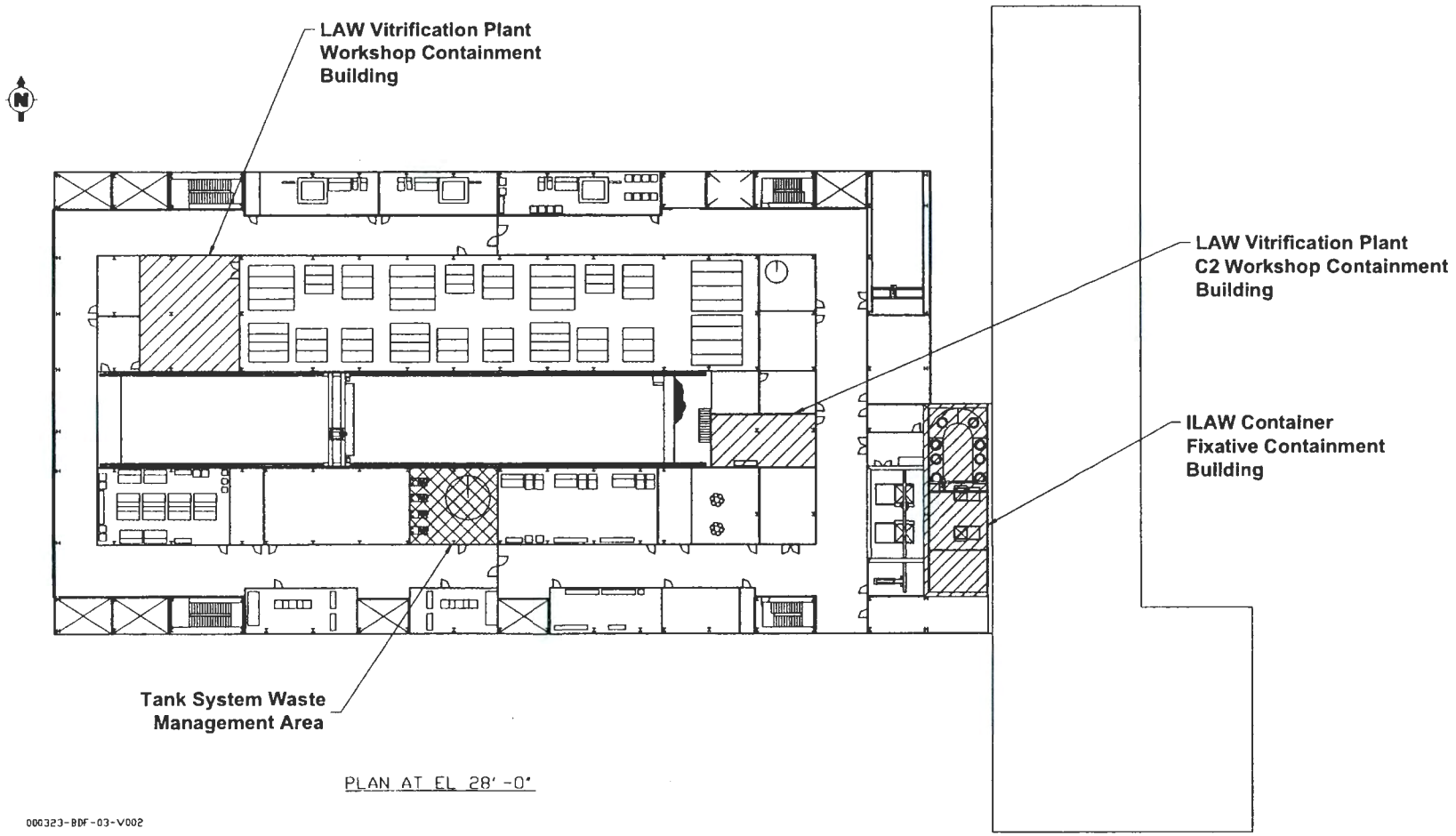


Figure 2-16. HLW Vitrification Plant (Elevation -16')

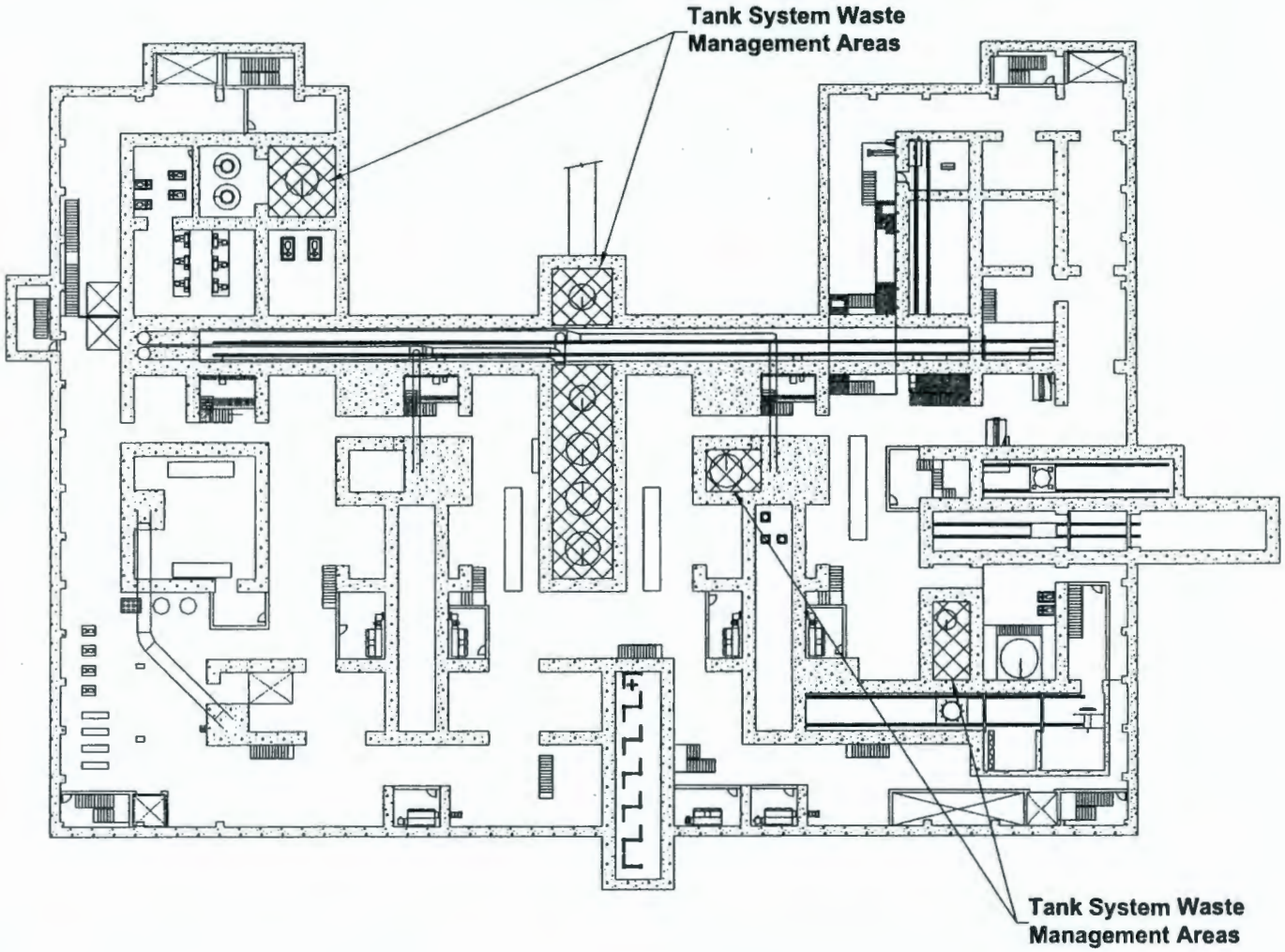


Figure 2-17. HLW Vitrification Plant (Elevation 0')

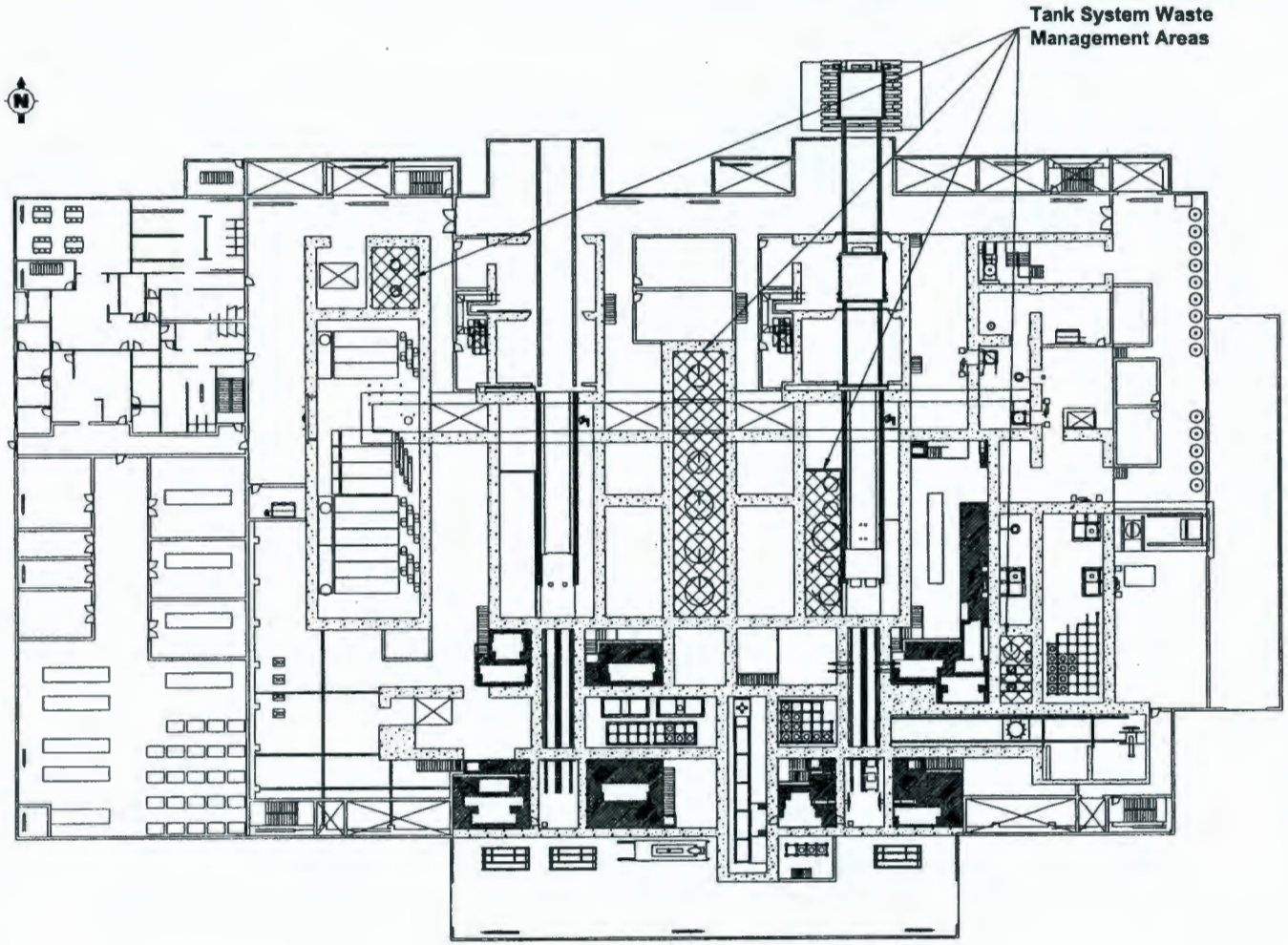


Figure 2-18. HLW Vitrification Plant (Elevation 11')

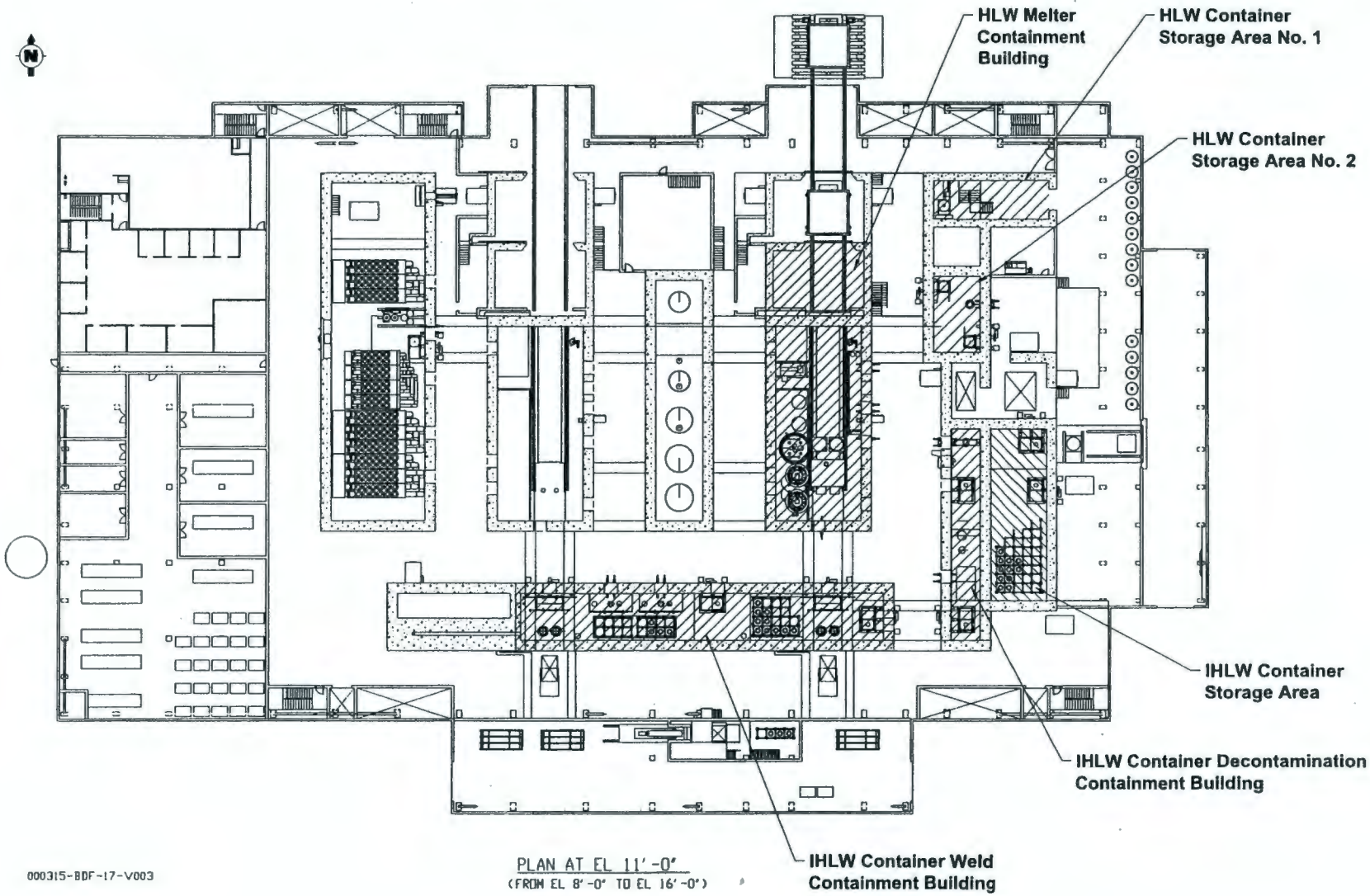
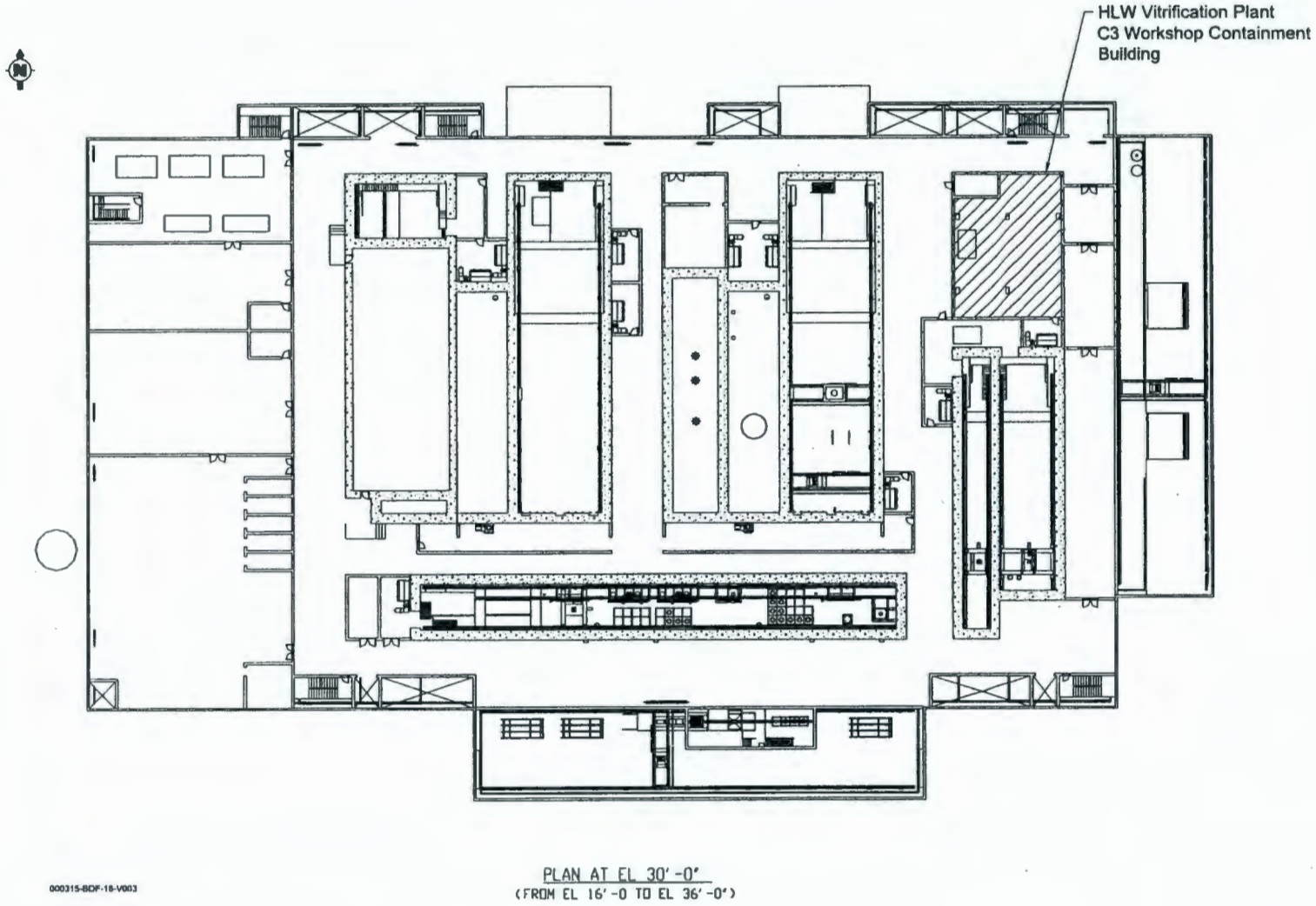


Figure 2-19. HLW Vitrification Plant (Elevation 30')



Chapter 3

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3. Waste Analysis Plan [C]

The River Protection Project - Waste Treatment Plant (RPP-WTP) Waste Analysis Plan addresses sampling and analysis activities necessary for compliance with the Washington State Dangerous Waste Regulations contained in Chapter 173-303 of the *Washington Administrative Code* (WAC).

The River Protection Project – Waste Treatment Plant Waste Analysis Plan is provided in Appendix 3A. The *Quality Assurance Project Plan for the Waste Analysis Plan* is provided in Appendix 3B.

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4. Process Information [D]

4.1. Introduction

This chapter and its appendices present information about the treatment processes and waste management units to be permitted in the River Protection Project - Waste Treatment Plant (RPP-WTP).

4.1.1. Process System Descriptions

Section 4.2 lists and summarizes the functions of all major engineering processes of the RPP-WTP, organized by process plant and system.

4.1.2. Regulated Waste Management Units

Section 4.3 presents design parameters associated with RPP-WTP waste management units. The RPP-WTP waste management units are as follows:

- Container storage areas
- Tank systems
- Miscellaneous units
- Containment buildings

All of the units, except one container storage area, will be used to manage mixed waste. There will be one dangerous waste container storage area.

4.1.3. Other Waste Management Units and Control Strategies

Section 4.4 discusses the use and applicability of other types of dangerous waste management and control strategies, including the following:

- Waste piles
- Surface impoundments
- Incinerators
- Landfills
- Land treatment
- Air emission controls
- Waste minimization
- Groundwater monitoring
- Functional design requirements

4.1.4. Engineering Support Documents

Appendix 4A will include pointers to supplements related to RPP-WTP process information such as the *Seismic Analysis and Design Approach Report* (SADAR), *Worked Example for Vessel V13024A*, mass balance, *Waste Compatibility and Structural Integrity of System Vessel and Piping*, completion schedule, and engineering description documents (EDDs).

4.1.5. Engineering Support Drawings

Appendix 4A also provides an index of engineering drawings for each system:

- Process flow diagrams (PFDs)
- General arrangement drawings
- Mechanical handling diagrams
- Ventilation flow diagrams (VFDs)

4.2. Process Description

4.2.1. Process Overview

The RPP-WTP will store and treat high-level waste (HLW) feed and low-activity waste (LAW) feed from the Hanford Site double-shell tank (DST) system unit. The term LAW feed generally refers to the supernatant portion of the DST system unit waste. LAW feed is comprised of three waste feed envelopes, which are described as follows:

- Envelope A. This LAW feed envelope will contain cesium and technetium at concentrations high enough to warrant removal of these radionuclides during pretreatment, to ensure that the immobilized low-activity waste (ILAW) glass waste meets applicable requirements.

- Envelope B. This LAW feed envelope will contain higher concentrations of cesium than envelope A. Both cesium and technetium must be removed to comply with the ILAW specifications. This envelope will also contain concentrations of chlorine, chromium, fluorine, phosphates, and sulfates that are higher than those found in envelope A, which may limit the waste incorporation rate into the glass.

- Envelope C. This LAW feed envelope will contain organic compounds complexed with strontium and transuranics (TRU) that will require removal in a processing step unique to this waste envelope. As with envelopes A and B, cesium and technetium will also require removal in the pretreatment process to ensure that ILAW glass waste meets applicable requirements.

The HLW feed will be in the form of a slurry containing approximately 10 to 200 grams of unwashed solids per liter. The liquid fraction of the slurry will be comprised of envelope A, B, or C waste and the solid fraction will be envelope D waste.

The RPP-WTP treatment processes are designed to immobilize the waste constituents in a glass matrix by vitrification and to treat the offgas from the processes to a level that protects human health and the environment.

Two similarly-designed vitrification systems will be used in the RPP-WTP. One system will immobilize the pretreated LAW feed, and the second will immobilize the pretreated HLW feed. The dangerous waste constituents in the melter feed will be destroyed, removed, or immobilized in a glass matrix through the vitrification process. The ILAW and immobilized high level waste (IHLW) produced by the RPP-WTP will be in the form of glass sealed in steel containers and placed in permitted treatment, storage, or disposal (TSD) facilities.

Secondary waste streams (e.g., radioactive and dangerous solid waste, nonradioactive and nondangerous liquid effluents, and radioactive and dangerous liquid effluents) will be characterized and recycled into the treatment process, transported to permitted TSD facilities located on the Hanford Site, or transported

offsite as appropriate. Nonradioactive dangerous waste may also be generated by laboratory and maintenance activities. This waste will be managed at the RPP-WTP until it can be transferred to an off-site permitted TSD facility.

There are four primary components of the process at the RPP-WTP: pretreatment, LAW pretreatment, LAW vitrification, and HLW vitrification. In addition, each of these waste treatment processes is supported by systems and utilities known as the balance of facility (BOF). The following discussion presents an overview of these waste treatment processes and BOF systems at the RPP-WTP. Figure 4-1 presents a simplified PFD of the RPP-WTP treatment processes.

Pretreatment and LAW Pretreatment

The LAW feeds will be stored and subsequently treated in the pretreatment and LAW pretreatment plants prior to vitrification. Pretreatment of the LAW feed will occur in the pretreatment and the LAW pretreatment plants. The processes in these two plants will condition LAW feed and remove cesium, technetium, strontium, TRU compounds, and entrained solids. Pretreatment of the HLW will occur in the pretreatment plant. The HLW feed will be processed through ultrafiltration to separate the solids. The permeate (liquid portion) from the ultrafiltration unit will be treated as LAW feed.

There will be three types of waste management units in the pretreatment plant and LAW pretreatment plant, as follows:

- Container storage areas
- Storage and treatment tanks
- Containment buildings (for the pretreatment plant only)

The structure of the pretreatment and LAW pretreatment plants will be supported by a reinforced concrete foundation. The superstructure will be made of structural steelwork with a metal roof. Typically, the process cells within the pretreatment and LAW pretreatment plants will be constructed of reinforced concrete to protect plant operators from radiation. The cell floors and a portion of the cell walls will be lined with stainless steel to provide secondary containment for the process tanks.

LAW Vitrification

The LAW vitrification plant will house the vitrification systems for production of the ILAW. Four types of waste management units will be located in the LAW vitrification plant, as follows:

- Container storage areas
- Storage and treatment tanks
- Miscellaneous units (the LAW melters)
- Containment buildings

The LAW vitrification plant building will be constructed of reinforced concrete and structural steelwork. The below-grade portion of the building structure will be made of reinforced concrete, and the superstructure will be made of reinforced concrete and structural steelwork with a metal roof. The plant structure will be supported by a reinforced concrete mat foundation. A protective coating will be applied to the concrete floor and walls of the LAW melter gallery. The process rooms that house mixed waste tanks and the melter pour cave will be lined with stainless steel.

HLW Vitrification

The HLW vitrification plant will house the vitrification systems for producing IHLW. Four types of waste management units will be located in the HLW vitrification plant, as follows:

- container storage areas
- treatment tanks
- miscellaneous unit (HLW melter)
- containment buildings

The HLW vitrification plant will be constructed of reinforced concrete and structural steelwork. The below-grade portion of the building structure will be of reinforced concrete construction, and the superstructure will be made of structural steelwork with a metal roof. The plant structure will be supported by a reinforced concrete mat foundation. The cell and cave floors and a portion of the cell and cave walls will be lined with stainless steel to provide secondary containment for the process tanks.

Balance of Facility

The BOF will include, by definition, support systems and utilities required for the waste treatment processes within the four main process areas (pretreatment, LAW pretreatment, LAW vitrification and HLW vitrification). However, the BOF is not regulated under WAC 173-303. The BOF support systems and utilities will include, but not be limited to, heating and cooling, process steam, process water, chilled water, and compressed air.

4.2.2. Pretreatment Plant

The pretreatment plant is designed to prepare the LAW and HLW feeds for vitrification. The main functions performed at the pretreatment plant will be as follows:

- Receive and store HLW and LAW feeds from the Hanford Site DST system unit
- Separate cesium, strontium and TRU radionuclides from the waste feeds
- Separate solids from the waste feeds
- Remove entrained solids from the waste feeds
- Concentrate the separated radionuclides
- Adjust the concentration of the waste
- Collect and monitor liquid effluents
- Blend waste fractions

Figure 4-2 presents the simplified PFD for the pretreatment plant.

The purpose of this section is to describe the major systems associated with the pretreatment plant. Table 4-1 lists the pretreatment system numbers and the corresponding engineering drawings. Descriptions of process systems associated with the pretreatment plant are provided in sections 4.2.2.1 through 4.2.2.10. Descriptions of the pretreatment plant mechanical support and miscellaneous waste handling systems are in section 4.2.2.11. Descriptions of the pretreatment plant ventilation systems are provided in section 4.2.2.12. Completion schedule information is presented in section 4.2.2.13. Engineering drawings and documents related to the pretreatment plant are also identified in Appendix 4A.

4.2.2.1. LAW Feed Receipt (PT System 110)

The LAW feed receipt system is shown in Figure 4-3. An EDD of the system is identified in Appendix 4A. The feed will be transferred from the DST system unit via two redundant double-walled underground pipelines. The system is a multiple-vessel system in which tanks are designed to perform the following functions:

- Receive LAW feed from the DST system unit and from the HLW pretreatment system (PT System 220)
- Store untreated and treated waste
- Transfer the waste

4.2.2.2. LAW Feed Evaporation (PT System 120)

The LAW feed evaporation system is shown in Figure 4-3. An EDD of the system is identified in Appendix 4A. The system will have the following primary functions:

- Receive LAW feed from PT System 110
- Adjust the concentration of the LAW feed for subsequent processing
- Transfer feed to the LAW ultrafiltration system (PT System 230)
- Condense the generated vapor and vent non-condensable gases

The LAW feed evaporator will operate at sub-atmospheric pressure to lower the boiling point of the feed to approximately 50 °C, to minimize corrosion. The vacuum will be provided by an ejector system on the evaporator overheads.

PT System 120 will receive LAW feed from PT System 110, permeate from HLW ultrafiltration, and recycled streams from the LAW pretreatment processes. Certain feeds will require concentration while others may require dilution or no concentration adjustment. Feed requiring concentration will be stored in two receipt tanks before being transferred to the LAW feed evaporator reboiler, where it will be heated in the reboiler's heat exchanger tubes. Sufficient hydrostatic head will be maintained in the reboiler to suppress the boiling point until the flow enters the separator, where flash evaporation will occur and the vapor and liquid streams will be separated. The liquid stream will continue to circulate through the reboiler and become more concentrated, while the vapor stream passes to a system of condensers. After the recirculating LAW feed becomes sufficiently concentrated, it will be transferred PT System 230 for further treatment.

The vapor stream will be condensed to a liquid in a three-stage system consisting of a primary condenser, an intercondenser, and an aftercondenser. Condensate from this system will pass to a process condensate pot, from which it will either be transferred to the process condensate collection system (LP System 510) or recycled through PT System 120. Non-condensable gases will pass to the pretreatment plant vessel vent system (PT System 540).

4.2.2.3. HLW Feed Receipt (PT System 210)

The HLW feed receipt system is shown in Figure 4-4. An EDD of the system is presented in Appendix 4A. The system will have the following primary functions:

- Receive and store HLW feed from the DST system unit
- Store HLW solids from PT System 220
- Store HLW waste streams from LAW pretreatment systems

This system will consist of six feed receipt and storage vessels and one HLW effluent collection vessel. The feed receipt and storage vessels will receive batches of HLW envelope D slurries from the DST system unit and store the pretreated solids from PT System 220. The system will also feed the HLW vitrification systems via the HLW feed blending vessel in PT System 220, and will receive recycle streams from HLW vitrification. Provision is also made to receive future waste streams not identified as envelope A, B, C, or D (i.e. feed from cesium and strontium capsule processing).

4.2.2.4. HLW Pretreatment (PT System 220)

The HLW pretreatment system is shown in Figure 4-5. An EDD of the system is identified in Appendix 4A. The system will have the following primary functions:

- Separate solids from liquids in HLW feed
- Wash the separated solids as required
- Blend HLW feed
- Transfer blended feed to the HLW vitrification systems

This system will consist of two ultrafiltration trains, permeate collection vessels and a feed blending vessel. HLW feed will be received from PT System 210 in one of two ultrafilter feed vessels. Feed will be circulated through the feed vessels and ultrafilters, where permeate will be separated from concentrated slurry. It will be possible to treat the separated solids further by washing and by the addition of reagents.

When sufficiently concentrated, the slurry will be transferred from the ultrafilter feed vessels and stored in PT System 210. When ready for vitrification, the slurry will be transferred back into PT System 220, where it will be mixed in the HLW feed blending vessel with the following:

- Concentrates from the cesium nitric acid recovery system (PT System 320) and technetium eluant recovery system (LP System 340)
- Entrained solids from the LAW ultrafiltration system (PT System 230) stored in PT system 210
- Strontium/TRU precipitates from the HLW feed receipt system (PT System 230) stored in PT System 210

The blended slurry will then be transferred from the HLW feed blending vessel to the HLW vitrification plant.

The permeate will be routed to the permeate collection vessels and then passed to PT System 120, where it will enter the LAW feed stream as envelope B feed. It will be possible to recycle permeate back to the ultrafilter feed vessels for further processing if it does not meet the desired process criteria.

4.2.2.5. LAW Ultrafiltration (PT System 230)

The LAW ultrafiltration system is shown in Figure 4-6. An EDD of the system is identified in Appendix 4A. The system will have the following functions:

- Remove entrained solids
- Precipitate and remove complexed strontium/TRU

- Store and transfer entrained solids to the DST system unit, the HLW system, or the LAW pretreatment plant
- Store complexed strontium/TRU and transfer it to PT System 210
- Store system permeate and transfer it to cesium removal using ion exchange (PT System 310)

Feed will be transferred to the ultrafiltration feed vessels. Subsequent treatment within PT System 230 will depend on whether the feed is envelope A or C.

For envelope A feed, the entrained solids will be concentrated using ultrafiltration. The resulting slurry will then be washed to reduce the sodium concentration to acceptable process levels. The washed entrained solids will be transferred to the DST system unit, LAW vitrification, or HLW feed receipt. Permeate from the initial concentrated slurry will be transferred to PT System 310. Each vessel will be vented to PT System 540.

The envelope C feed will require removal of both entrained solids and strontium/TRU precipitation. The strontium/TRU in envelope C will be precipitated using selected reagents. The precipitate will add solids to any entrained solids that may already be present in envelope C. The resulting slurry will be washed with condensate or process water to reduce the sodium concentration to acceptable levels, and then routed along with the wash solution permeates to PT System 210. Permeate from the slurry will be collected and routed to PT System 310.

Envelope B is the supernatant portion of HLW as received from the DST system unit. Envelope B has already been filtered as HLW permeate. Under normal operation, envelope B waste will be routed first to PT System 120 and then to PT System 310 without processing through PT System 230. However, if additional solids removal is required, envelope B will be processed through PT System 230 in a manner similar to envelope A.

4.2.2.6. Cesium Removal Using Ion Exchange (PT System 310)

The cesium removal using ion exchange system is shown in Figure 4-7. An EDD of the system is identified in Appendix 4A. Its primary functions will be to:

- Remove cesium from the LAW permeate received as envelope A, B, or C
- Prepare the retained cesium for subsequent concentration, storage and transfer to the HLW vitrification process

The permeate from PT System 230 will be transferred to the LAW feed tank and pumped through the cesium ion exchange columns. There will be four main and one final ion exchange columns. The four main columns will be arranged in two sets in parallel, each comprising two columns in series (one lead and one lag). One set will operate in the loading (cesium removal) cycle while the other is being rinsed, eluted, and regenerated. The final, or trailing, column will function as a third column in series for either pair of main columns during loading.

The column effluent will be continuously monitored to determine breakthrough at two key locations: between the lead and lag main columns, and after the lag column. Treated LAW will be collected and evaluated daily in the treated LAW collection tank.

When the lead column experiences approximately 50 percent cesium breakthrough, the two main columns will be taken off line and the resin in the two main columns will be regenerated. All loading operations

through both sets of main columns will cease during regeneration of the trailing column, which will occur rarely. Typically, resin regeneration will consist of these consecutive steps:

1 Displacement of residual feed with caustic solution
2 Rinsing with process demineralized water
3 Elution of cesium ions with nitric acid
4 Rinsing with demineralized water
5 Regeneration with caustic solution

The nitric acid eluate will be collected and transferred to PT System 320. On an as-needed basis, spent resin will be removed and managed by the spent resin collection and dewatering system (LP System 370); and fresh resin will be added by the cesium fresh resin addition system (PT System 360). Resin may be routed to the HLW or LAW melters for incorporation into glass. The resin might also be chemically treated and routed as a cesium recycle stream in the process. Chemically treating the resin to recycle cesium would involve digesting the resin.

The eluate from PT System 310 will be evaluated for adequate removal of cesium. If cesium concentrations in the treated effluent are within target values, the effluent from PT system 310 will be transferred to technetium removal system (LP System 330). If cesium concentrations in the effluent are above target values it will be blended or recycled through the PT System 310. The stream exiting from an ion exchange column is termed "eluate" and the stream feeding an ion exchange column for elution is termed "eluant".

4.2.2.7. Cesium Nitric Acid Recovery (PT System 320)

The cesium nitric acid recovery system is shown in Figure 4-8. An EDD of the system is identified in Appendix 4A. Its primary functions will be to:

- Recover nitric acid from the PT System 310 eluate for reuse
- Concentrate and store eluted cesium for incorporation in the HLW melter feed handled by PT System 220

Cesium eluate will be received in batches in receipt vessels, evaluated for concentrations of acid, salt, and cesium, and then transferred to the evaporator kettle. There the eluate will be heated using a steam jacket and the vapors will be allowed to pass through the sieve-tray rectifier column to improve the separation between nitric acid and water. As needed, the evaporator kettle will be shut down and the concentrated cesium eluate will be transferred to the cesium/technetium concentrate storage tank, which will then be routed to PT System 220.

Underflow from the rectifier column, which comprises the recovered acid stream (eluant), will flow by gravity feed to the recovered acid tank for reuse as eluant in the cesium ion exchange columns. The acidic condensate will be transferred to the pretreatment plant wash and effluent collection system (PT System 550), where it will be neutralized before being recycled to PT System 120. Vapors will travel from the top of the rectifier column through two condensers. The residual vapors will be treated in PT System 540.

4.2.2.8. Cesium Fresh Resin Addition (PT System 360)

The cesium fresh resin addition system is shown in Figure 4-9. The system will have the following primary functions:

- Chemically condition cesium resins
- Remove fines from resins prior to addition to the ion-exchange columns
- Transfer fresh resin to the ion exchange columns

In PT system 360, fresh cesium resin will be conditioned by hydraulically removing fines from the bulk of the resin particles. The conditioned fresh resin will be then be added to the cesium ion exchange columns (PT System 310) as a slurry. The resin will then be chemically conditioned by soaking the resin in a dilute sodium hydroxide solution. This treatment will expand the resin, remove air trapped in its internal pores, and maintain the resin at the optimum pH. The resin will then be water rinsed and further conditioned by sequentially passing nitric acid, water, and caustic solution through it.

4.2.2.9. Pretreatment Plant Vessel Vent (PT System 540)

The pretreatment plant vessel vent system will include high-efficiency mist eliminators (HEMEs), a volatile organic carbon (VOC) oxidizer unit, high-efficiency particulate air (HEPA) filters, and carbon bed adsorbers (See Figure 4-10). It includes a header for reverse-flow diverters (RFD) and pulse-jet mixers (PJM) exhaust streams, and two headers for vessel vent offgas streams. An EDD of the system is identified in Appendix 4A. Its primary functions will be to:

- Collect offgas from pretreatment vessel vents
- Remove particulates, liquid droplets and mists from vent system offgas
- Prevent condensation in the ventilation system HEPA filters
- Absorb soluble gases
- Adsorb and oxidize organic gases
- Collect exhaust streams from the pretreatment process system RFD and PJM exhaust streams

Vessel vent offgas streams will be collected into two separate major headers prior to treatment. Gases containing VOCs collected in the VOC header from process vessels will be treated in an oxidation unit, where VOCs will be destroyed. In the other header, vent gases will be treated in a countercurrent, packed bed caustic scrubber, which will collect particulates and absorb gases. Typically, scrubber water will be recirculated, and excess scrubber water will be routed to PT System 550.

The two treated offgas streams will then be combined and passed through one of two parallel HEME trains, which will remove particulates, liquid droplets and mist. The parallel configuration will allow for daily water washing of the offline train without affecting ongoing operations.

The treated vent gases will then be combined with heated air from the PT C3 area ventilation system (PT System 730). The hot air will lower the relative humidity of the combined air stream prior to the HEPA filters. This combined stream will pass through HEPA filters and then through one of two parallel carbon bed adsorbers for trace organic removal. While one adsorber is used for organic removal, it will be possible to put the second unit through carbon regeneration or replacement or maintenance, without affecting ongoing operations. The carbon will be regenerated using steam, as needed; and the regeneration effluent will be routed back to the VOC oxidizer. The treated vessel vent gases will then be discharged through the pretreatment plant stack.

RFD and PJM exhaust streams will be combined and routed through four HEMEs. The HEMEs will be arranged in series; while three of the units are in service, the fourth unit will be undergoing water washing. A stream of heated air from a C3 area will then be combined with the treated RFD and PJM exhaust streams. The purpose of the hot air injection will be to lower the relative humidity of the combined air stream prior to the HEPA filters. These combined streams will be routed through HEPA filters prior to atmospheric discharge through the pretreatment plant stack.

The system will use upstream and downstream systems to maintain a negative pressure in each process vessel and contain air-borne radionuclides. Upstream, an air inlet system will regulate in-bleed rates to the process vessels. Downstream, ventilation fans will pull air through the system.

The pretreatment plant vessel ventilation system will meet all applicable air regulations.

4.2.2.10. Pretreatment Plant Wash and Effluent Collection (PT System 550)

The primary function of this system will be to receive, store, and transfer effluent. It will collect plant wash and drains, and acidic and alkaline effluent from the pretreatment plant. A simplified flow diagram of the system is presented in Figure 4-11. An EDD of the system is identified in Appendix 4A.

During normal operations, the IHLW container decontamination solution will be collected and mixed in the plant wash vessel. The solution will be sampled to measure pH and any excess acidic effluent will be neutralized. Effluents will be recycled to PT System 120. The plant wash vessel will vent to PT System 540.

Acidic and alkaline effluents from the pretreatment plant will be received in either a primary or a secondary acidic/alkaline effluent vessel, depending on the source. The primary acidic/alkaline effluent vessel will receive wastes from the following sources:

- LAW ultrafiltration cleaning solution
- Cesium ion exchange column rinsing
- Cesium eluate evaporator overheads condensate
- Vessel vent mist elimination effluent

The secondary acidic/alkaline effluent vessel will receive wastes from these sources:

- LAW ultrafiltration cleaning solution
- Primary acidic/alkaline effluent vessel overflows
- Vessel vent scrubbing solution
- Equipment decontamination solution

In both vessels, the acidic and alkaline effluents will be mixed to neutralize the effluents. The mixture will be sampled and neutralized, if necessary. When the effluent meets the predetermined pH value, it will be transferred to PT System 120 for recycling.

The system vessels are designed to withstand the anticipated heat of reaction generated by mixing the effluents. Only low concentrations of acidic and caustic solutions will be mixed during normal operations, keeping the temperature well within design limits. Higher concentrations of acidic and caustic effluents may be mixed during non-routine operations, with a greater increase in heat generation. The system will monitor temperature rise in the vessels and will automatically stop the effluent receipt when the temperature reaches a predetermined set point well within design limits.

The plant wash vessel and the primary and secondary acidic/alkaline effluent vessels will vent to PT System 540.

4.2.2.11. Pretreatment Maintenance Facility (PT Systems 410, 420, 430, 440, 450)

The pretreatment plant will include a maintenance facility that will enable remote and hands-on maintenance of wet process equipment, and will consist of the following systems.

- PT System 410: in-cell handling
- PT System 420: in-cell mechanical equipment
- PT System 430: decontamination
- PT System 440: out-cell handling
- PT System 450: out-cell mechanical equipment and containment

The individual systems and their primary functions are described below:

In-Cell Handling (PT System 410)

The primary function of the in-cell handling system will be to transfer equipment and materials into and out of the maintenance cell and between various disassembly, decontamination, and monitoring stations within the maintenance cell.

The system will consist of a crane, power chuck, power manipulator, pedestal manipulator, and master-slave manipulators (MSMs). This system will allow the transfer of both failed and repaired equipment into and out of the cell for hands-on-repair, using remote-controlled tools and other equipment. The system will provide a means of assisting, maneuvering and maintaining equipment in PT System 420 and PT System 430.

In addition, PT System 410 will be used for waste staging, packaging, decontamination, and transferring out of the cell. It has been designed to minimize process downtime and maximize in-cell equipment handling flexibility.

In-Cell Mechanical Equipment (PT System 420)

The primary function of this system will be to disassemble, repair, and reassemble pumps, ultrafilters, instruments, and valves transported to the maintenance cell. System equipment will include tools such as bench-mounted chucks, bolt removers, large and small nut runners, torque reaction posts, fixtures or adapters, jacking stands and turnover fixtures. The system will also include post in/out ports, through-wall drives, shield caps, tool stands and trays.

Decontamination (PT System 430)

The primary function of this system will be to remove deposits from the exterior surfaces of the wet process equipment and any failed in-cell equipment. The system will consist of a pump bowl decontamination vessel and a large decontamination vessel.

The initial decontamination step will use nitric acid and a water rinse in the pump bowl decontamination vessel. The second decontamination step, if required, will use nitric acid and a water rinse in the large decontamination vessel. If these two steps do not reduce the levels of radiological contamination to an acceptable level, other methods will be chosen on a case-by-case basis. Effluents from the decontamination vessels will be routed to PT System 550.

Out-Cell Handling (PT System 440)

The primary function of this system will be to provide the equipment to transport failed and replacement wet process equipment, such as pumps, ultrafilters, valves, and instruments, between the process location and either the maintenance facility or the C3 workshops. (See section 4.2.2.12 for additional information on the C3 confinement zone.) The major equipment used to accomplish the transfer activities will include a large electrical overhead traveling crane, a flask or cask, a portable gamma gate, lifting fixtures, transfer bogies and related control systems. Bogie transport systems comprise a trolley and intra-cell rail system.

The crane will move the flask before and after it is loaded with failed wet process and support equipment. The receipt export bogie (transfer bogie) located under the post-out port will be used for moving items between the flask load and unload position and the maintenance cell. The workshop bogie under the maintenance cell post-out/in port will be used for moving items in both directions between the maintenance cell and the C3 workshop for hands-on repair and return to service.

Out-Cell Mechanical Equipment and Containment (PT System 450)

The primary function of this system will be to provide the equipment and systems to interface between the in-cell and out-cell systems throughout the facility, and to perform maintenance-related activities on that equipment. The equipment is located on the maintenance facility cave face, in the workshops (C2 and C3), in the waste export/storage areas, bulge areas, filter change areas and other areas throughout the facility containing specialty equipment.

Mechanical equipment in these areas includes, but is not limited to, motors or actuators, hydraulic power units, cameras, special lighting, sample/swipe collection enclosure, survey equipment, tools, vacuums, decontamination equipment and booths (workshop and flask maintenance), special doors, and platforms. In addition, the equipment supporting failed equipment removal from in-cell (process floor), bulge, filter room (metal, glass or HEPA) or lab areas may include flasks or casks, custom temporary overpacks, compactors, and repack or void fill stations. The specific mechanical equipment requirements for all areas of the facility will be quantified and identified as the design matures.

4.2.2.12. Pretreatment Plant Ventilation (PT Systems 710, 720, 730, 750, and 770)

A primary consideration in the design of the ventilation systems is the need to confine the airborne sources of contamination to protect human health and the environment during normal and abnormal operating conditions. Barriers or barrier systems, including ventilation systems, will minimize the release of contaminants.

The pretreatment plant will be divided into five numbered zones, listed below, with the higher number indicating greater radiological hazard potential, and therefore a need for a greater degree of control or restriction. The ventilation system zoning is based on the classifications assigned to building areas for potential contamination. Zones classified as C5 are potentially the most contaminated, such as the pretreatment cells. Zones classified as C1 are uncontaminated areas.

Confinement will be achieved by maintaining C5 areas at the greatest negative pressure, with airflow cascading from C2 areas via C3 areas to the C5 areas through engineered routes. There will be no C4 areas in the pretreatment plant. The cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and hence the amount of air requiring treatment. Adherence to this concept in the design and operation of the waste treatment plant will ensure that the

plant air does not become a significant source of exposure to operators, and that the air emissions do not endanger human health and the environment.

PT C1 Areas Ventilation (PT System 710)

C1 areas typically consist of uncontaminated offices, control rooms and equipment rooms. C1 areas will be slightly pressurized if they are adjacent to areas with higher contamination potential, to eliminate backflow from those areas.

PT C2 Areas Ventilation (PT System 720)

C2 areas typically consist of operating areas, equipment rooms, stores, access corridors, and plant rooms. Filtered and tempered air will be supplied to these areas by the C2 supply system. Where there is no cascade to C3 areas and where the building construction allows, air in excess of supply will be extracted from C2 areas by the C2 extraction system to maintain a nominal negative pressure with respect to outside atmosphere. This air will continuously be monitored for beta and gamma radiation prior to discharge to the atmosphere via a dedicated local stack.

PT C3 Areas Ventilation (PT System 730)

C3 areas are normally unoccupied, but allow operator access during maintenance. Access from a C2 area to a C3 area will be via a C2/C3 subchange room. C3 areas typically consist of filter plant rooms, workshops, maintenance areas, and monitoring areas. Air will generally be drawn from C2 areas and, wherever possible, cascaded through the C3 areas into C5 areas, or alternatively extracted by the C3 extraction system. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms.

When sufficient air cannot be cascaded into a C3 areas a dedicated C2 supply can be used with an actuated damper on the C2 supply duct, which will be closed in the event of a loss of C3 extract. C3 extract will receive single-stage HEPA filtration and continuous radiological monitoring prior to atmospheric discharge. Fans designed to maintain continuous system operation will drive the airflow in the system. This system will also be interlocked with the C5 heating, ventilating, and air conditioning (HVAC) system to prevent backflow by shutting down the C3 system if the C5 HVAC system shuts down.

PT C5 Areas Ventilation (PT System 750)

The PT C5 areas are designed with the cell or cave perimeter providing radiation shielding as well as confinement for ventilation purposes. C5 areas typically consist of a series of process cells. Each process cell will contain the waste storage and treatment equipment. Air will be cascaded into the C5 areas, generally from adjacent C3 areas, and extracted by the C5 extraction system. If there is a requirement for engineered duct entries through the C5 confinement boundary, they will be protected by backflow HEPA filters, with all penetrations through the boundary sealed. C5 extract will receive two-stage HEPA filtration and continuous monitoring prior to atmospheric discharge. Fans designed to maintain continuous system operation will drive the airflow. This system will also be interlocked with the C3 HVAC system, to prevent backflow by shutting down the C3 system if the C5 HVAC system shuts down.

Pretreatment Vessel Vent Extract (PT System 770)

The pretreatment vessel vent extraction system will receive offgas from PT System 540, provide HEPA filtration, and discharge the offgas through the pretreatment plant stack. This system is designed to manage the emission of dangerous and radioactive materials during process operations and radioactive waste storage.

Process vent offgas streams will be treated by PT System 540. These streams will then be routed to PT System 770 for dual-stage HEPA filtration and radiological monitoring, prior to being discharged through the pretreatment plant stack. This system will maintain a negative pressure on the vessels relative to their cells. Fans designed to maintain continuous system operation will extract offgas from PT System 540 and convey it through PT System 770.

Constituent loading in the pretreatment vessel vent extraction system is expected to be significantly lower than the loading in the LAW and HLW melter offgas systems.

4.2.2.13. Pretreatment Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided will include the final pretreatment system design. A complete list of completion schedule items is identified in Appendix 4A.

4.2.3. LAW Pretreatment Plant

Following the removal of cesium in the pretreatment plant, the LAW feed will be transferred to the LAW pretreatment plant for additional treatment prior to LAW vitrification. Its main functions will be as follows:

- Separate technetium from the LAW feed
- Concentrate the treated LAW feed
- Dewater the spent ion exchange resin and package for disposal
- Collect and monitor liquid effluents

Figure 4-12 presents the simplified PFD of the LAW pretreatment plant.

The purpose of this section is to describe the major systems associated with the LAW pretreatment plant. Table 4-2 lists the LAW pretreatment plant system numbers and the corresponding engineering drawings. Descriptions of major process systems associated with the LAW pretreatment plant are provided in sections 4.2.3.1 through 4.2.3.8. Descriptions of the LAW pretreatment plant spent resin and miscellaneous solid waste handling systems are in section 4.2.3.9. Descriptions of the LAW pretreatment plant ventilation systems are provided in section 4.2.3.10. Completion schedule information is presented in section 4.2.3.11. Engineering drawings and documents related to the LAW pretreatment plant are also identified in Appendix 4A.

4.2.3.1. Technetium Removal Using Ion Exchange (LP System 330)

The technetium removal using ion exchange system is shown in Figure 4-13. An EDD of the system is identified in Appendix 4A. The system will have the following primary functions:

- Receive treated waste feed from the pretreatment plant
- Remove technetium from the treated LAW received from PT System 310

- Prepare the retained technetium for subsequent concentration, storage, and ultimate transfer to PT System 220

Treated waste feed from PT System 310 will be received in the technetium ion exchange feed buffer. The technetium removal using ion exchange system will consist of four ion exchange columns, arranged as two sets of two columns in parallel. One set will operate in the loading cycle while the other set is being regenerated. System effluent will be monitored to determine technetium concentration. If necessary, this stream will be recycled back to the tank that feeds the technetium removal system. Each set will comprise two columns in series, with one operating as the lead column and the other as the lag column.

When the lead column experiences approximately 50 percent technetium breakthrough, the two columns will be taken offline and the resin will be regenerated. Typically, resin regeneration will consist of the following steps:

1 Displacement of residual feed with caustic solution
2 Rinsing with demineralized process water
3 Elution of sodium pertechnetate
4 pH adjustment with caustic solution

On an as-needed basis, the eluate will be collected and transferred to LP System 340 for recycling. The spent resin will be removed and managed by LP System 370 and fresh resin will be added by the technetium fresh resin addition system (LP System 365). The vessels will be vented to the LAW pretreatment plant vessel vent system (LP System 540).

The eluate from technetium removal system will be evaluated for adequate removal of technetium. If the technetium concentrations are within target values, the effluent will be transferred to the LAW melter feed evaporation system (LP System 130). However, off-specification technetium effluents will be managed by blending or recycle through LP system 330.

4.2.3.2. Technetium Eluant Recovery (LP System 340)

The technetium eluant recovery system is shown in Figure 4-14. An EDD of the system is identified in Appendix 4A. Typically, water will be used as the eluant, but the system design has accommodated recovery using nitric acid if needed. The primary functions of this system will be to:

- Recover eluant from LP System 330 eluate
- Concentrate and store eluted technetium for further treatment

Technetium eluate will be received in receipt vessels, where it will be evaluated for concentrations of sodium and technetium, and then transferred to the evaporator kettle. There the eluate will be heated using a steam jacket and the vapors will be allowed to pass through a rectifier column. As needed, the evaporator kettle will be shut down and the concentrated technetium eluate transferred to the cesium/technetium concentrate storage tank within the PT System 320.

Underflow from the rectifier column, which comprises the recovered eluant stream, will flow by gravity feed to the recovered eluant tank for reuse as eluant in LP System 330. Vapors from the top of the rectifier column will pass through two in-series condensers. Non-condensable gases will be routed to LP System 540 for treatment, and condensate will be routed to the plant wash and drain collection system (LP System 550).

4.2.3.3. Technetium Fresh Resin Addition (LP System 365)

The technetium fresh resin addition system is shown in Figure 4-15. The system will have the following primary functions:

- Chemically condition technetium resins prior to addition to the ion exchange columns
- Remove fines from resins prior to addition to the ion exchange columns
- Transfer fresh resin to the ion exchange columns

When spent resin is removed from the ion exchange columns, the system will replace it with a batch of chemically-conditioned fresh resin. The resin is hydrophobic and will first be chemically conditioned in a diluted sodium hydroxide solution to wet its surfaces. Conditioning the resin will also promote expansion of its matrix and help maintain it at optimum pH, which will increase ion exchange efficiency.

Small resin particles (fines) in the ion exchange columns can cause operational problems. Therefore, fines will be removed after chemical conditioning by first agitating the resin in its caustic solution, to cause the lighter fines to overflow the conditioning vessel into an overflow tank. The contents of the overflow tank will then be pumped through a filter. The permeate will be recycled and the filtered solids will be disposed of as non-dangerous solid waste.

Conditioned resin will be delivered as a slurry by gravity flow to the ion exchange columns. The transfer lines will be flushed with process water after each transfer. Flush water will be recycled as resin flush liquor.

4.2.3.4. Spent Resin Collection and Dewatering (LP System 370)

The spent resin collection and dewatering system is shown in Figure 4-16. An EDD of the system is identified in Appendix 4A. The system will have the following primary functions:

- Remove spent resin from any of the cesium or technetium ion exchange columns
- Separate recovered resin from flush solution
- Recover spent resin for disposal or melter feed
- Dewater resin to meet Hanford TSD acceptance criteria
- Recover resin flush solution and fresh resin addition solution for reuse or processing through the LAW feed evaporator

Resins used in the ion exchange columns cannot be regenerated indefinitely, because extended radiation exposure reduces their loading capacity, and repeated acid, water, and caustic washes used in resin elution, rinsing and regeneration cause chemical degradation and loss of exchanger efficiency. Therefore, the resin must periodically be removed from the ion exchange columns and replaced.

The spent resin collection process will begin by fluidizing the ion exchange columns using a flush liquor, and hydraulically discharging the contents into either of two sloped-bottom spent resin collection vessels. In these vessels, the resin slurry will be circulated, monitored for cesium and technetium content, and delivered to a sampling system to determine whether the resin is in compliance with the Hanford Site solid waste acceptance criteria (HSSWAC) (HNF-EP-0063). Resin that does not meet the predetermined treatment limits for cesium and technetium content will be routed back to the ion exchange columns for

re-elution. The treated resin that does not meet the HSSWAC will be routed to either the LAW melters or the HLW melter.

Spent resins that meet the HSSWAC will be dewatered and stored within the LAW pretreatment plant prior to transferring to a Hanford TSD. Both spent resin and flush liquor will be transferred from the collection vessels to resin dewatering containers (LP System 410). Water will be removed first by pumping out the free liquor, and then by circulating air through the resin and a moisture separation vessel, until the moisture content of the resin is sufficiently reduced. The liquor from the resin dewatering containers and the moisture separation vessel will be routed back to the resin flush collection vessel, to be used as flush liquor or overflow to the LAW melter feed evaporation system.

4.2.3.5. LAW Melter Feed Evaporation (LP System 130)

The LAW melter feed evaporation system is shown in Figure 4-17. An EDD of the system is identified in Appendix 4A. The system will have the following primary functions:

- Receive LAW feed from LP System 330 and SBS purge liquor from the LAW melter offgas systems (LV Systems 231, 232, 233, 234)
- Concentrate the LAW feed in an evaporator
- Transfer concentrated liquid feed to LAW melter feed lag storage (LP System 140)
- Condense the generated vapor and vent non-condensable gases

The LAW melter feed evaporator will operate at sub-atmospheric pressure to reduce the boiling point of the feed to approximately 50 °C to minimize corrosion. The vacuum will be provided by a two-stage ejector system on the evaporator overheads. Feed received into the evaporator will first be heated in the reboiler's heat exchanger tubes. Sufficient hydrostatic head will be maintained in the reboiler to suppress the boiling point until the flow enters the evaporator vessel, where flash evaporation will occur, and the vapor and liquid streams will be separated. The liquid stream will continue to circulate through the reboiler and become more concentrated, while the vapor stream passes to a system of condensers.

After the recirculating LAW liquid feed becomes sufficiently concentrated, it will be transferred to the LAW concentrate hold vessel. The LAW concentrate hold vessel will also be able to receive entrained solids from PT System 230. During the pretreatment startup period before the LAW melters become operational, the LAW concentrate hold vessel will be discharged into the entrained solids hold vessels in PT System 230. After the LAW melters become operational, the LAW concentrate hold vessel will be discharged to LP System 140, prior to transfer to the LAW vitrification plant.

The vapor stream will be condensed to a liquid in a three-stage system consisting of a primary condenser, an inter-condenser, and an after-condenser. Condensate from this system will pass to the process condensate pot. From there it will be routed to LP System 510 if it meets the Hanford Site liquid waste acceptance criteria (HSLWAC) (HNF-3172), or recycled to the LAW melter feed evaporator if it exceeds the HSLWAC. Non-condensable gases will pass to LP System 540.

4.2.3.6. LAW Melter Feed Lag Storage (LP System 140)

The LAW melter feed lag storage system is shown in Figure 4-18. An EDD of the system is identified in Appendix 4A. Its primary functions will be to provide buffer storage capacity between the LAW pretreatment plant and the LAW vitrification plant.

The LAW melter feed will be transferred from LP System 130 to two buffer tanks. Flow into the two buffer tanks will function on an online/offline basis, with one vessel feeding the LAW vitrification plant while the other is receiving LAW melter feed. The temperature of the two tanks will be monitored and controlled to avoid crystallization.

4.2.3.7. LAW Pretreatment Plant Vessel Vent (LP System 540)

The LAW pretreatment plant vessel vent system is shown in Figure 4-19. It will include a header for RFD and PJM exhaust and two headers for vessel vent offgas. An EDD of the system is identified in Appendix 4A. It will include a VOC oxidation unit, HEPA filters, and carbon bed adsorbers. Its primary functions will be:

- Collect offgas from LAW pretreatment vessel vents
- Remove particulates from vent system offgas
- Prevent condensation in the LAW pretreatment plant ventilation system HEPA filters
- Adsorb or oxidize organic gases, or both
- Collect exhaust streams from LAW pretreatment system RFD and PJM pumps
- Combine treated vessel vent offgas with treated RFD and PJM exhaust streams for discharge to the pretreatment plant stack

Vessel vent offgas streams will be collected into two separate major headers prior to treatment. Gases containing VOCs collected in the VOC header will be treated in a VOC oxidation unit for VOC destruction. Vent gases in the other header from process vessels will be combined with the oxidized VOC header gases.

The treated vent gases will then be combined with a stream of heated air from a C3 area. The purpose of the hot air injection is to reduce relative humidity of the air stream and protect the downstream HEPA filters. This combined stream will pass through HEPA filters and then through one of two parallel carbon bed adsorbers for trace organic removal. The off-line unit will be able to undergo carbon regeneration or replacement or maintenance without affecting ongoing operations. The carbon will be regenerated as needed with steam; and the regeneration effluent will be routed back to the VOC oxidizer. The treated vessel vent gases will then be discharged through the pretreatment plant exhaust stack.

RFD and PJM pump exhausts will be combined and also mixed with a stream of heated air originating from a C3 area. The hot air injection lowers relative humidity to protect the downstream HEPA filters. These combined streams will be routed through HEPA filters prior to atmospheric discharge through the pretreatment plant exhaust stack.

The system will use upstream and downstream systems to maintain a negative pressure in each process vessel and contain air-borne radionuclides. Upstream, an air inlet system will regulate in-bleed rates to the process vessels. Downstream, ventilation fans will drive air through the system.

4.2.3.8. LAW Pretreatment Plant Effluent Collection (LP Systems 510 and 550)

The primary function of these systems will be to receive, store, and transfer liquid effluent. LP System 510 will receive low-activity effluent, and LP System 550 will receive suspect active effluent. Liquid effluents from the systems will be recycled or discharged to the Hanford Site liquid effluent retention facility (LERF) and then transferred to the effluent treatment facility (ETF). Vessels in the system will be vented to the LAW pretreatment plant vessel vent system (LP System 540). A simplified flow diagram of

LP Systems 510 and 550 is presented in Figure 4-20. An EDD of the system is identified in Appendix 4A.

Process Condensate Collection (LP System 510)

This system will include three process condensate vessels. Major effluents collected by the systems will be as follows:

- LAW feed evaporator condensate
- LAW melter feed evaporator condensate

Under normal operation, the effluent meeting the HSLWAC will be recycled to the LAW pretreatment plant or the pretreatment plant. Excess effluent will be discharged to the ETF. Effluents can also be routed to LP System 130 for reprocessing, if required.

Plant Wash and Drains (LP System 550)

The major components of LP System 550 will be the plant wash vessel and two alkaline effluent vessels.

Typically, the plant wash vessel will receive the submerged bed scrubber (SBS) purge liquid from LAW vitrification plant. On a non-routine basis this system also receives effluent from the LAW pretreatment plant and vitrification plant washdown operations. The feeds will be neutralized to a predetermined pH value and sampled to determine whether they meet the HSLWAC. Effluents that meet the HSLWAC will be routed to LP System 510 for either recycling or ETF discharge. Effluents can also be routed to LP System 130 for treatment, if required.

Major effluents collected by the two alkaline effluent vessels will be as follows:

- LAW pretreatment plant: caustic rinse water and process condensate from the technetium removal using ion exchange system
- HLW vitrification plant: caustic effluent from low-activity waste vessel
- LAW vitrification plant: caustic effluent from the scrubber blowdown vessel

In the vessels, the feeds will be mixed and sampled to determine whether they meet the HSLWAC. Effluents that comply will be routed to LP System 510 for either recycling or ETF discharge, while non-compliant effluents will be routed to LP System 130 for treatment.

4.2.3.9. LAW Pretreatment Plant Spent Resin and Miscellaneous Solid Waste Handling (LP Systems 410, 450)

LAW pretreatment plant solid waste containers will be managed within two systems:

- LP System 410: spent resin solids handling
- LP System 450: miscellaneous solid waste handling and disposal

Spent Resin Solids Handling (LP System 410)

The purpose of this system will be to collect spent resin from LP System 370 and prepare it for shipment to a Hanford Site TSD. Dewatering containers will be moved into the dewatering cave and locked into position under a resin fill head. After the container is engaged to the fill head, LP System 370 will fill the

container with a resin slurry and dewater the resin to a predetermined moisture content. The container will include an internal screen that facilitates dewatering and will be disposed of with the container.

After dewatering has been completed, the containers will be moved to the lidding station and lids will be permanently attached using a crimping or welding mechanism. The containers will then be transferred through export shield doors to the monitoring and decontamination area. A swabbing process will be used to determine whether the top, sides, and bottom of the containers meet predetermined radiological contamination levels. Containers that do not meet the requirements will be moved to the decontamination station and decontaminated using a wash system before being returned to the monitoring station. When the containers meet the requirements, they will be moved to the container staging and cask loading area and loaded into shielded transportation casks. The containers will be stored at the LAW pretreatment plant container storage area or the RPP-WTP CWS area prior to transfer to a Hanford Site TSD. Additional information on both storage areas is provided in section 4.3.1.

Miscellaneous Solid Waste Handling and Disposal (LP System 450)

The primary function of this system will be to provide packaging for miscellaneous waste streams generated from routine and non-routine activities that support the LAW pretreatment plant. This will comprise failed equipment, tools, metal parts, rags, gloves, lubricants, oils, HEPA filters, wastes generated from painting, chemicals such as solvents, and other hazardous chemicals. At the point of generation, wastes will be packaged into 55 gallon drums, 85 gallon overpacks and other miscellaneous waste containers that comply with applicable standards.

After packaging, all wastes will be transferred along designated routes to accumulation areas to be weighed, characterized and placarded for shipment. The containers will be decontaminated and surveyed to verify acceptable contamination levels prior to exiting the facility. The containers will be stored at the RPP-WTP CWS area prior to transferring to a Hanford TSD. Additional information on the RPP-WTP CWS area is provided in section 4.3.1.

4.2.3.10. LAW Pretreatment Ventilation (LP Systems 710, 720, 730, 750, 770)

A primary consideration in the design of the ventilation systems is the need to confine the airborne sources of contamination to protect human health and the environment during normal and abnormal operating conditions. Barriers, including ventilation systems, will contain and minimize the release of contamination.

The LAW pretreatment plant will be divided into four numbered zones, listed below, with the higher number indicating greater radiological hazard potential, and therefore a requirement for a greater degree of control or restriction. The ventilation system zoning is based on the classifications assigned to building areas for potential radiological contamination. Zones classified as C5, such as the pretreatment cells in the LAW pretreatment plant, are potentially the most contaminated; while zones classified as C1 are uncontaminated areas.

Confinement will be achieved by maintaining C5 areas at the greatest negative pressure, with airflow cascading from C2 areas via C3 areas to the C5 areas through engineered routes. There will be no C4 areas in the LAW pretreatment plant. The principle of a cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and hence the amount of air requiring treatment. Adherence to these principles in the design and operation of the waste treatment plant will ensure that the plant air does not become a significant source of exposure to operators, and that the air emissions are not harmful to human health and the environment.

LP C1 Areas Ventilation (LP System 710)

C1 areas typically consist of uncontaminated offices, control rooms and equipment rooms. They will be slightly pressurized if they are adjacent to areas with higher contamination potential, to eliminate backflow from those areas.

LP C2 Areas Ventilation (LP System 720)

C2 areas typically consist of operating areas, equipment rooms, stores, access corridors, and plant rooms. Air will be supplied to these areas by the C2 supply system. Where there is no cascade to C3 areas and where the building construction allows, air in excess of supply will be removed by the C2 extraction system to maintain a nominal negative pressure with respect to outside atmosphere.

LP C3 Areas Ventilation (LP System 730)

C3 areas are normally unoccupied, but allow operator access during maintenance. These areas will, by virtue of their location and the activities performed within them, have an increased potential for the release of contamination. Access from a C2 area to a C3 area will be via a C2/C3 subchange room. C3 areas typically consist of filter plant rooms, maintenance areas and monitoring areas. Air will generally be drawn from C2 areas and, wherever possible, cascaded through the C3 areas into C5 areas, or alternatively extracted by the C3 extraction system. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms. When sufficient air cannot be cascaded into C3 areas, then a dedicated C2 supply can be used with an actuated damper on the C2 supply duct, which will be closed in the event of a loss of C3 extract. C3 extract receives single-stage HEPA filtration prior to atmospheric discharge.

LP C5 Areas Ventilation (LP System 750)

The RPP-WTP C5 areas are designed with the cell or cave perimeter providing radiation shielding as well as confinement for ventilation purposes. C5 areas typically consist of a series of process cells. Each process cell will contain the waste storage and treatment equipment.

Air will be cascaded into the C5 areas, generally from adjacent C3 areas, and removed by the C5 extraction system. If there is a requirement for engineered duct entries through the C5 confinement boundary they will be protected by backflow HEPA filters, with all penetrations through the boundary sealed. C5 extract will receive dual-stage HEPA filtration prior to atmospheric discharge.

LAW Pretreatment Vessel Vent Extract (LP System 770)

The LAW pretreatment vessel vent extraction system will receive offgas from LP System 540, provide HEPA filtration, and discharge the offgas through the pretreatment plant stack. LP System 770 is designed to manage emissions generated during process operations and waste storage.

Process vent offgas streams, depending on the source, will be treated by scrubbers and other air pollution control equipment in LP System 540. These streams will then be routed to LP 770 for dual stage HEPA-filtration prior to being discharged through the pretreatment plant stack. This system will maintain a negative pressure on the vessels relative to the vessels' cells. The vessels' cells will be managed by the LP C5 areas ventilation system (LP System 750).

Constituent loading in the LAW pretreatment vessel vent extract system is expected to be significantly lower than the loading in the LAW and HLW melter offgas systems.

4.2.3.11. LAW Pretreatment Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided will include the final LAW pretreatment system design. A complete list of completion schedule items is identified in Appendix 4A.

4.2.4. LAW Vitrification

The purpose of this section is to describe the major systems associated with the LAW vitrification plant. This plant will consist of several process systems designed to perform the following functions:

- Hold pretreated LAW waste slurry
- Convert blended LAW waste slurry and glass formers into molten glass
- Provide melter offgas treatment systems
- Provide ILAW container handling systems
- Provide ILAW container finishing systems
- Provide storage areas for ILAW containers
- Provide supporting equipment for the melter
- Provide miscellaneous waste handling systems
- Provide LAW vitrification plant ventilation systems

Figure 4-21 presents the simplified PFD of the LAW vitrification plant. Table 4-3 is a list of the LAW vitrification system numbers and corresponding engineering drawings.

Descriptions of the LAW vitrification process and melter offgas treatment systems are provided in sections 4.2.4.1 through 4.2.4.4. Descriptions of the ILAW glass container handling systems are in section 4.2.4.5. Descriptions of the mechanical support and miscellaneous waste handling systems are in sections 4.2.4.6 through 4.2.4.7. Descriptions of the LAW vitrification plant ventilation systems are in section 4.2.4.8. Completion schedule information is presented in section 4.2.4.9. Engineering drawings and documents related to the LAW vitrification plant are identified in Appendix 4A.

4.2.4.1. LAW Melter Feed (LV Systems 110, 131, 132, 133)

The LAW melter feed system will consist of concentrate vessels (LV System 110) and melter feed preparation and feed vessels (LV Systems 131, 132, 133). An illustration of the LAW melter feed systems is shown in Figure 4-22. An EDD of the system is identified in Appendix 4A. The primary functions of this system will be to:

- Receive LAW concentrate from the LAW pretreatment plant
- Mix glass formers with LAW concentrate to form a uniform slurry
- Provide a blended slurry feed to the LAW melters

The LAW concentrate will be transferred from the pretreatment plant to the feed concentrate vessels. Process control samples will be collected from these vessels and analyzed to determine the glass former formulation. The glass-forming chemicals that are expected to be used include silica, alumina, boric acid, calcium silicate, ferric oxide, lithium carbonate, magnesium silicate, zircon sand, and zinc oxide.

The LAW concentrate will then be transferred from the concentrate vessels to the LAW melter feed preparation vessels, where it will be mixed with glass formers from the LAW chemical feed hoppers.

This will form a uniform slurry, which will be transferred to the LAW melter feed vessels, and then to the melters.

4.2.4.2. LAW Melter (LV Systems 211, 212, 213)

An illustration of the relationship between the LAW melter systems and melter feed systems is shown in Figure 4-22. An EDD of the system is identified in Appendix 4A. The primary functions of the LAW melter systems will be to:

- Convert blended waste slurry into molten glass
- Discharge molten glass to ILAW containers

The LAW melters will receive blended melter feed slurry, consisting of glass formers and LAW feed concentrate, from the LAW melter feed vessels (LV Systems 131, 132, 133). The LAW melters will be locally shielded and will be operated and maintained in a personnel access area. The details of the LAW melter support system are described in LV System 244. The melter will be at a negative air pressure to the melter gallery to ensure that any air leaks are inward. The melters will be refractory-lined rectangular tanks with outer steel casings. These casings will be fitted with water cooling jackets to maintain a thermal gradient in the refractory material for corrosion control, to suppress outward migration of glass, and to reduce the heat load in the adjacent areas. The feed will be heated by passing an alternating electrical current between electrodes in the glass pool, in a process known as joule-heating.

Feed will be introduced to the melter as a slurry through nozzles in the melter lid. The water and volatile feed constituents in the slurry will evaporate, leaving behind a layer of material known as the cold cap. New slurry will be added at about the same rate as the cold cap dissolves, maintaining the quantity of cold cap material at a steady level. Waste feed components that remain in the cold cap will undergo chemical reactions, be converted to their respective oxides, and dissolve in the melt. Air injectors will be used to mix and agitate the molten glass.

Steam, volatile feed constituents and decomposition products will be released as offgas during the vitrification process. This offgas, along with air from inleakage, purges and injections, will be routed to the LAW melter offgas treatment systems (LV Systems 231, 232, 233, 234).

Each melter will have two discharge chambers, which will contain troughs connected to pour heads for pouring molten glass into containers. The process of filling LAW glass waste containers will be handled by the LAW melter glass pour systems (LV Systems 221 - 226). Additional information on the LAW locally-shielded melter (LSM) is provided in section 4.3.3.

The LAW LSMs will be operated and maintained in a personnel access area. Each will be fitted with its own containment and shielding. The outer melter shell will be maintained at a lower pressure than the surrounding area to prevent the escape of contaminants. A rail system will facilitate removal and replacement of the entire melter structure. All open crevices, seams, and interface openings will be sealed to ensure complete containment and isolation from the environment.

4.2.4.3. LAW Melter Offgas Treatment (LV Systems 231, 232, 233, 234)

The LAW melter offgas treatment system will consist of primary, secondary and standby systems (LV Systems 231, 232, 233, 234). Illustrations of these systems are presented in Figure 4-23 and Figure 4-24. An EDD of the system is identified in Appendix 4A. The primary functions of the LAW melter offgas treatment system will be to:

- Treat generated melter offgas prior to discharge to the plant stack

- Collect and treat vessel vents
- Prevent melter pressurization

Primary Offgas Treatment

The primary melter offgas system will cool the offgas and remove aerosols generated by the melter during the vitrification process. It will consist of three parallel systems; each dedicated to a specific LAW melter. Each primary system will comprise an air film cooler, a SBS, and a wet electrostatic precipitator (WESP).

The air film cooler will reduce the temperature of the offgas before it enters the SBS, where offgas bubbles will be drawn through a flooded packed bed. There, steam will be condensed, the gas will be further cooled, and larger particles, aerosols, and soluble solids will be removed. The WESP will provide high-efficiency removal of sub-micron particulates and aerosols, and protect the downstream HEPA filters from the need for frequent replacement. Ionizing electrodes in the center of tubes within the WESP will create a strong electrical field that charges particulate matter entrained in the offgas stream. The charged particles will be removed from the offgas as they adhere to the oppositely-charged tube walls. Condensate from the SBS will be collected in the condensate collection vessel and pumped to LAW vitrification plant liquid effluent system (LV system 510). The water from the WESP tubes will be collected in the C3/C5 drain/sump collecting vessel and transferred to the LAW pretreatment plant for concentration and recycling through LV system 510.

Standby Offgas Treatment

The standby offgas treatment system will consist of a backup air film cooler, which will provide an alternate route for offgas to the SBS. The standby line will be opened by a fast actuating butterfly valve, and will route the offgas through a separate air film cooler before releasing it to the SBS. The primary offgas line will not be closed when the standby line is opened.

Use of the standby system is expected to be infrequent, taking place when a melter experiences reduced vacuum. This may result from a constriction or plug in the primary line from the melter to the SBS due to particulate buildup on the pipe walls. Reduced vacuum could also result from other abnormal situations, including a melter offgas surge in excess of the design basis of seven times condensable gases and three times noncondensable gases; or from a general electrical power failure. Such power failures are estimated to occur on average once in 10 years, and the standby generators may take 15 to 30 seconds to come on-line. If the capacities of the primary and standby offgas treatment systems are exceeded and melter pressurization occurs during this power transition, or during other abnormal situations, the excess offgas will be released from the melter into the melter cave to protect the melter. The melter cave will be ventilated as part of the LAW vitrification plant ventilation systems, and HEPA filtered prior to release in the LAW vitrification plant stack.

Secondary Offgas Treatment

The three dedicated primary melter offgas streams will be combined into a single stream for additional treatment in the secondary LAW melter offgas treatment system. The LAW vessel vent header will also be routed to the secondary LAW melter offgas treatment system at this point.

The secondary offgas treatment system will consist of HEPA filters, a thermal catalytic oxidizer/catalytic reducer, and a caustic scrubber.

The HEPA filters, which are designed to achieve 99.999 percent efficiency, will further remove particulates and aerosols. The thermal catalytic oxidizer will remove VOCs from the offgas stream, after which the catalytic reducers will remove nitrogen oxide using ammonia as a reducing agent. The offgas stream will then enter the packed caustic scrubber column, moving countercurrent to a trickling caustic liquid stream, which will remove iodine-129.

After passing through this treatment train, the offgas will be released to the atmosphere through the LAW vitrification plant stack. Liquid blowdown from the caustic scrubber may be routed to the LAW pretreatment plant for treatment.

The LAW melter offgas treatment system will meet all applicable air regulations.

4.2.4.4. LAW Vitrification Plant Liquid Effluent (LV System 510)

The primary purpose of this system will be to receive, store, and transfer routine and non-routine LAW secondary effluent streams for subsequent treatment or disposal. Routine effluents are those liquids or slurries routinely or periodically generated during vitrification. Non-routine effluents include vessel, equipment and cell washes; spills; vessel overflows; fire protection water discharges; and sump, floor drain and sink discharges. An illustration of the system is shown in Figure 4-25. An EDD of the system is identified in Appendix 4A.

The three primary components of LV System 510 will be the plant wash collection vessel, the C3/C5 drain/sump collection vessel, and the SBS purge collection vessel. The plant wash collection vessel will have the capacity to handle either the volume of the largest vessel or the largest volume from vessel or equipment washdown in the LAW vitrification plant. The C3/C5 drain/sump collection vessel will handle the WESP drains on routine basis. C3 area fire protection discharge and floor wash will be collected in the C3/C5 drain/sump on a non-routine basis. The SBS purge collection vessel will receive purge effluent from the SBS. The effluents of all three LV system 510 vessels will be routed to the pretreatment plant.

4.2.4.5. ILAW Glass Container Handling (LV Systems 221, 222, 223, 224, 225, 226, 311/312, 313, 314, 321, 331/332, 340)

The ILAW glass container handling activities will consist of the following systems.

- LV Systems 221 - 226: LAW melter glass pouring, sampling, and lid handling
- LV System 311/312: ILAW container receipt and transfer lines 1 and 2
- LV System 313: ILAW container pour cave transfer
- LV System 314: ILAW container buffer storage
- LV System 321/322: ILAW container inert fill and lid weld
- LV System 331/332: ILAW container decontamination, swabbing, and monitoring
- LV System 340: ILAW container storage and export

The individual systems and their primary functions are described below. EDDs identified in Appendix 4A provide additional detail.

LAW Melter Glass Pour (LV Systems 221, 222, 223, 224, 225, 226)

The primary functions of these systems will be to:

- Place empty containers at the melter discharge port
- Fill the containers
- Provide level detection for the containers
- Cool containers and export out of the melter pour cave

There will be three LSMs in the LAW vitrification plant, each with two redundant glass discharge areas. Each melter discharge has a glass pour cave and associated features for pouring glass. Each pour cave will be physically isolated from the other for maintenance access. A container turntable and elevator will be provided in each pour cave for handling containers. The turntable will accommodate three containers and rotate them through three positions:

- Container import/export position
- Container fill position
- Container cooling position

In an individual container cycle, the empty container, with its lid removed, will be placed on the turntable import/export position by the ILAW container pour cave transfer system (LV System 313). The turntable will rotate to position the container at the glass fill position. The container elevator will then raise the empty container from the turntable and interface it with the melter discharge head. Typically, glass pouring will be done in three batches. Fill level will be monitored by a thermal imaging camera and dual gamma detectors that provide high level alarm and a high-high level shutdown of glass pouring.

After filling, the container will remain positioned at the glass pour seal head for approximately an hour to recover residual glass discharges from the pour trough and provide initial cooling of the poured glass. The elevator will then lower the full container to the turntable. The turntable will rotate to position the container at a cooling position, where a ventilation shroud will cover the container opening to contain glass vapors during cooling. Following cooling, the turntable will rotate to position the container at the import/export position for lid replacement and removal from the turntable, and transferring to the ILAW container buffer storage area (LV system 314) or the inert fill and lid weld area (LV system 321/322).

ILAW Container Receipt and Transfer Lines 1 and 2 (LV System 311/312)

The ILAW container receipt and transfer lines 1 and 2 system will receive and transfer new containers to the LAW melter monorail import/export stations.

New containers will be received in the receiving truck bay. Delivery trucks will be offloaded by overhead crane and the wrapped containers will be staged onto the receiving dock. Container wrap will be removed and the containers will be inspected for surface damage resulting from shipping. Any damaged containers will be routed for return and logged into the plant tracking system.

Containers which meet initial screening requirements will be placed into the container receipt and import bay. Individual containers will subsequently be placed on the container inspection stand, where operators will assess the upper head and lifting flange area, including the condition of the fill opening and the inside of the container, and the proper fit of the shipping lid. Containers that fail inspection will be logged or tagged appropriately and staged for removal. Containers that pass inspection will be logged into the plant tracking system and placed on the import staging conveyor. When an empty container is needed, a monorail crane grapple will transfer it to a designated monorail crane import area (LV System 313).

ILAW Container Pour Cave Transfer (LV System 313)

The ILAW container pour cave transfer system will transport product containers between LV System 311/312 and the pour turntable (LV System 221–226). Empty product containers will be transferred from the container transfer bogie to the pour turntable, and full product containers from the pour turntable to the transfer bogie.

A transfer bogie will transport an empty product container through the bogie transfer tunnel to one of six monorail load/unload positions, serviced by six monorail hoist units. A hoist unit will carry the empty product container through the pour cave shield doors into the pour cave, where it will be placed into the import/export position on the pour turntable. A similar method will be used in reverse for the transfer of a full product container from the pour turntable.

The system will also contain an area for decontamination of the monorail to enable maintenance.

ILAW Container Buffer Storage (LV System 314)

LV System 314 will consist of two ILAW storage areas: the container buffer storage area and the container buffer store and rework area. The primary function of the ILAW buffer store will be to provide a storage area in the event that downstream ILAW container processing lines are temporarily backed up. The ILAW buffer store/rework area will primarily be used for ILAW container rework. LV System 314 will provide equipment and controls to perform the following tasks:

- ILAW container transfer to buffer store, buffer store/rework area
- ILAW container rework

There are twelve container storage positions in the container buffer store, and nine in the product container buffer store/rework area. The rework area is fitted with a powered turntable supported with a pair of MSMs and a shielded window. All the buffer store operations will be conducted remotely.

The system will also contain an area for decontamination of equipment, to enable hands-on maintenance.

ILAW Container Inert Fill and Lid Weld (LV System 321/322)

The ILAW container inert fill and lid weld system will have the following primary functions:

- Collect glass samples
- Add inert fill material to filled ILAW glass containers
- Install and weld a closure lid

Glass sampling, inert fill and final lid welding activities will take place in the inert fill and lidding cave. There will be two working stations within this cave: the glass sample/inert fill station and the welding station. The ILAW containers will be individually transported to the inert fill and lidding cave by a transfer bogie (LV System 311/312). An overhead crane will lift the container through the import hatch and places it at the inert filling station. Typically, glass waste is not expected on the exterior of the container. However, cameras will be used to inspect the outside of the container for glass residue, and if necessary a needle gun will be used to remove glass. A MSM will then remove the temporary lid and retrieve a glass sample.

Prior to inert filling, ultrasonic measuring equipment will be used to determine required inert fill volume, if any. After filling, the container surface receiving the temporary lid will be cleaned and the lid will be placed back on the ILAW container.

At the weld station, the lid lifter removes the temporary lid, picks up the primary lid, and places it on the container, using an automatic gas tungsten arc welding (GTAW) process. Although most welding is expected to be autogenous, requiring no filler material, the equipment will be able to add inert filler material if warranted. The welding torch current, voltage, pulsing frequency, angle, travel speed and travel direction will be automatically preprogrammed with all the acceptable welding parameters. All welding parameters will be recorded and the weld will be visually inspected for integrity and quality control criteria. Rejected welds will be repaired by one of three different methods: remelting the original weld, mechanically removing the defective weld with the flange conditioning tool and rewelding using filler material, or by welding a secondary lid over the primary lid.

When the container meets acceptable criteria it will be exported to the ILAW container decontamination, swabbing and monitoring system (LV System 331/332) using an overhead crane and grapple.

ILAW Container Decontamination, Swabbing and Monitoring (LV System 331/332)

The purpose of LV Systems 331/332 will be to decontaminate sealed ILAW containers and verify that residual contamination levels meet requirements. Decontamination of the ILAW containers will be necessary to reduce contamination levels for subsequent container handling, transportation, and disposal. The finished containers will be transferred to the ILAW container storage and export system (LV System 340) by crane.

The LV Systems 331/332 will include equipment and facilities to conduct the following processes on the ILAW containers:

- Decontamination
- Swabbing and swab-export
- Monitoring and exporting

The decontamination area will be located in the finishing line cave in the LAW vitrification plant. Decontamination lines will be equipped with in-cell cameras. Separate lines that are mirror images of each other will include components such as power manipulators, turntables, cranes and hoists, and a bogie.

Carbon dioxide blasting technology will be used to decontaminate the containers. There will be two independent, remotely-operated decontamination systems. Each system will have a carbon dioxide pelletizer, blasting gun and vacuum system, and they will share a carbon dioxide storage tank and compressor.

Carbon dioxide ice particles will be blasted onto the surface of the container using a compressed air blasting gun. The carbon dioxide pellets will turn into vapor on contact. As the pellets hit the container surface, their energy will cause them to shatter and fragment, penetrating the container surface and dislodging surface contamination. The airborne contaminants will be collected by a vacuum head and treated through HEPA filters. From these HEPA filters the air stream will flow to the LAW vitrification plant ventilation systems HEPA filters and stack, prior to atmospheric discharge.

After decontamination, the containers will be transported to the swabbing station onto a swab-posting machine, and wiped or swabbed with an absorbent material using a power manipulator. The swab will be

placed into the monitoring glovebox, where an alpha/beta/gamma scanner will measure radioactivity. If the radiological level exceeds area criteria, the container will be reworked. However, if the radiological level meets the area C2 criteria, the container will be transported to the ILAW container storage and export system (LV System 340).

Most containers are expected to meet the area C2 criteria after decontamination, but occasionally a fixative station will be used to reduce the overall contamination level. At the fixative station, the container will be placed on the cooling and drying stand until the desired temperature is achieved. The fixative crane will transport the container into the fixative booth, where a fixative will be applied to cover the entire container surface. After curing on the cooling and drying stand, the container will be returned to the swabbing station for retesting. If the radiological level exceeds the C2 area criteria, the container will be reworked. If the radiological level meets C2 criteria, the turntable bogie will move it into the monitoring and export station, where surface radiological levels will be measured as part of a quality assurance process. The inspected container will be exported from the decontamination area to ILAW container storage and export system (LV System 340).

ILAW Container Storage and Export (LV System 340)

LV System 340 will store decontaminated ILAW containers received from the ILAW container decontamination, swabbing, and monitoring systems (LV Systems 331/332), and will prepare the containers for shipment. The LV System 340 will include equipment and facilities to conduct the following activities:

- Handling and transporting containers from the ILAW container monitoring area system to the ILAW storage area
- Handling ILAW containers within the storage and export areas
- Visually confirming each container's unique alphanumeric identifier
- Monitoring contamination levels on ILAW containers and transport flasks

The primary facilities associated with LV System 340 will include an import cell that accepts the decontaminated containers, a monitoring cell, a container storage area, and a truck bay for container export. The normal operations that will be associated with the LV System 340 are summarized below.

Container import – The import cell will receive decontaminated ILAW containers after the radiation levels have been verified within specifications. The ILAW container will be lifted from the import cell to the storage area using a crane system.

Container storage and monitoring – Prior to ILAW storage, an operator will records the container's identification. The container will then be placed in the storage area, which will be designed to hold 450 ILAW containers. CCTV cameras will provide general viewing of the ILAW containers and the storage area. Inspection of ILAW containers is described in Chapter 6.

Container export will occur when the disposal facility is ready to receive the ILAW containers. Before the ILAW containers are placed into the transport flasks they will be visually checked, and each containers' alphanumeric identifier will be confirmed. In addition, they will be monitored for contamination levels. If acceptable, the container can be exported. After the operator has recorded the inspection and monitoring information, the ILAW containers will be lifted by crane and placed into individual flasks for transporting to a permitted TSD facility.

4.2.4.6. LAW Locally Shielded Melter Equipment Support (LV System 244)

The primary function of LV System 244 is to provide the equipment and support necessary to complete maintenance tasks on all melters and equipment in the melter gallery of the LAW vitrification plant. The primary equipment to be used to support the maintenance efforts are the melter gallery process crane, consumable change-out boxes (CCBs), CCB handler, lifting head, melter gamma gate, and bubbler cover removal tool.

The system will occupy a charge floor at the 19 ft 9 in. level of the melter gallery, which separates the operation area from the LAW melters, work platforms, and service racks on the melter gallery floor. Service connections available to the melter will be process air, instrument air, argon connections, cooling water, process water, demineralized water, low-pressure steam, thermocouple connections, lid heater power connections, offgas connections, feed line connections, and electrode bus connections.

Melter consumables will be removed through the top of the melter shielding. Melter consumable items will be those that require routine and non-routine maintenance, but provide necessary functions to continue melter operations. The routine consumable items will be bubbler assemblies. Refractory thermocouples, airlifts, level detectors feed nozzles and film coolers will be considered non-routine. In addition, the discharge chamber lid will remove as a unit to replace failed heaters.

The CCB will be used to replace melter bubbler assemblies as routine maintenance operations. On a monthly basis, each LAW melter will require nine bubbler assemblies to be replaced.

The remaining consumables will not be considered routine maintenance. They will be replaced according to the appropriate procedures and with appropriate equipment.

A custom-designed system will be used for replacing melter lid heaters. This system will consist of an isolation gate bolted to the top of the discharge chamber, and a box used for transporting and disposing of used lid assemblies. An identical box will be used for transporting new lid assemblies. The spent lid heater package will be routed to the LAW LSM consumables import/export and disposal system (LV System 431).

4.2.4.7. LAW LSM Changeout, and Solid Waste Packaging and Disposal (LV Systems 421, 431, 450)

LAW LSM melter change-out, and solid waste packaging and disposal, will consist of the following systems:

- LV System 421: LAW LSM import/export
- LV System 431: LAW LSM consumables import/export and disposal
- LV System 450: LAW miscellaneous solid waste packaging and disposal

The individual systems and their primary functions are described below.

LAW LSM Import/Export (LV System 421)

The primary functions of this system will be to provide:

- Import, positioning and anchorage of a new LAW LSM in the LAW vitrification plant
- Export of spent melters from the LAW vitrification plant

The LSM design allows transfers between the C2 and C3 airlocks, and provides containment for the LAW melter, with the ability to remove the contamination on the exterior of the LSM. All open crevices, seams, and interface openings will be sealed to ensure complete containment and isolation from the environment.

Import/export of the LSM will be accomplished through the use of an independent linear driving assembly and a roller assembly integral to each LSM unit. Each operation area will house a separate melter roller track assembly, mounted on the floor, for a total of three separate systems in the LAW vitrification plant. The melter linear drive, supported by its own carriage and roller system, will be driven by a variable frequency drive motor equipped with torque and speed controls. The linear drive will have a pinned connection to the LSM that will pull or push the LSM into operational position.

LV System 421 will include a decontamination hatchway and platform that facilitates surveying and decontamination of the underside of the LSM. Decontamination activities are expected to be minimal.

LAW LSM Consumables Import/Export and Disposal (LV System 431)

The primary functions of this system will be to provide equipment and controls to perform the following tasks:

- Provide methods and packaging for the import of new LSM bubbler assemblies for installation into the LSM
- Provide methods and packaging for the export of spent LSM bubbler assemblies removed from the LSM
- Provide interface with LV System 244 for handling installation and removal of LSM consumables

The LAW LSM consumable import/export and disposal system (LV system 431) will consist of handling equipment to facilitate the import and export of new and spent LSM bubbler assemblies into the LAW vitrification plant. Handling of the bubblers is accomplished through the use of packaging in which one bubbler assembly will be contained. The packaging or CCBs, supplied by LV System 244, will be used as the handling interface for all import and export activities, including interface with LV System 244 for installation and removal of the bubbler from the LSM.

Handling of the CCBs for import and export to and from the LAW vitrification plant will be facilitated by the use of the CCB rack assembly, which will be used to handle nine CCBs in a horizontal orientation as a package. The CCBs will be transported into an offload area via truck, and the rack assembly will be handled with a crane for offloading. A bogie system will be used to move the CCB rack assembly into a preparation area inside of the LAW vitrification plant, where the rack will be offloaded with crane and moved to an import/export area. The CCBs will be transferred to LV System 244 through a trapdoor in the ceiling of the import/export area.

During export activities, the CCBs will be received from LV System 244 and the exterior surfaces of the CCBs will be radiologically surveyed, and decontamination will be performed utilizing manual decontamination methods, if needed. The CCB will then be transferred into the preparation area, placed into the CCB transfer rack, and exported from the LAW vitrification plant.

LAW Miscellaneous Solid Waste Packaging and Disposal (LV System 450)

The primary functions of this system will be to provide:

- Methods and packaging for the change-out of LAW melter process vessels

- Methods and packaging for LAW plant miscellaneous mixed waste

The vessel and system design characteristics of LAW LSM process vessels are expected to minimize the need for replacement. In the event of a failure, the failed melter process vessel will be prepared for export by washout, disconnection of the process lines, and decontamination. The vessel will be lifted out of the process cell and covered by a herculite bag, to prevent contamination. It will be exported from the facility, using a boom crane, through a removable roof hatch. The crane will place the vessel into an approved overpack container staged for vessel receipt. Once closed and secured the overpack, containing the vessel, will be delivered to the RPP-WTP CWS area.

A similar process in reverse will be used for the introduction and installation of new LAW melter process vessels.

Disposal of miscellaneous mixed waste streams created during operation will be accomplished by packaging at the point of generation. This miscellaneous mixed waste, generated through normal plant and maintenance operations for the entire LAW nitrification plant, will consist of, but may not be limited to, metal scraps, failed equipment, spent solvents and spent lubricants. Localized collection points and disposal routes will be established at logical and optimal locations to accommodate maintenance and operations. Waste containers will be transferred to the staging areas, each 20 x 20 ft in area. Here, packages will be weighed, placarded, and decontaminated for non-fixed contamination, if needed, prior to export. The packaged waste forms will then be transferred to the RPP-WTP CWS area.

4.2.4.8. LAW Vitrification Plant Ventilation (LV Systems 710, 720, 730, 750)

A primary factor in the design of the ventilation systems is the need to confine the sources of contamination, to protect human health and the environment during normal and abnormal operating conditions. Barriers or barrier systems, including ventilation systems, contain and minimize the release of contaminants.

The LAW vitrification plant will be divided into four numbered zones, listed and defined below, with the higher number indicating greater radiological hazard potential and therefore a requirement for a greater degree of control or restriction. The zoning of the ventilation system will be based on the classifications assigned to building areas for potential radiological contamination. Zones classified as C5 are potentially the most contaminated and include the glass pouring and cooling cells, which are operated remotely. Zones classified as C1 are uncontaminated areas.

Containment will be achieved by maintaining C5 areas at the greatest negative pressure, with airflows cascaded through engineered routes from C2 areas to C3 areas and on to the C5 areas. The cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and hence the amount of air requiring treatment. Adherence to this concept in the design and operation of the LAW vitrification plant will ensure that the plant air does not become a significant source of exposure to operators, and that the air emissions do not endanger human health or the environment.

LAW C1 Areas Ventilation (LV System 710)

C1 areas will typically consist of offices, workshops, control rooms, and equipment rooms. They will be slightly pressurized if they are adjacent to areas with higher contamination potential, to eliminate backflow from those areas.

LAW C2 Areas Ventilation (LV System 720)

C2 areas will typically consist of operating areas, equipment rooms, stores, access corridors, and plant rooms adjacent to areas with higher contamination potential. Air will be supplied to these areas by the C2 supply system. Where there is no cascade to C3 areas and where the building construction allows, air in excess of supply will be removed from C2 areas by the C2 extraction system to maintain a nominal negative pressure to ambient.

LAW C3 Areas Ventilation (LV System 730)

C3 areas are normally unoccupied, but allow operator access, for instance during maintenance. By virtue of their location and the activities performed within them, these areas have an increased potential for the release of contamination. C3 areas will typically consist of filter plant rooms, workshops, maintenance areas, and monitoring areas. Air will generally be drawn from C2 areas and, wherever possible, cascaded through the C3 areas into C5 areas, or alternatively extracted from the C3 areas by the C3 extraction system. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms. When sufficient air cannot be cascaded into C3 areas, a dedicated C2 supply equipped with appropriate backflow prevention will be used.

LAW C5 Areas Ventilation (LV System 750)

In general, air cascaded into the C5 areas will be from adjacent C3 areas. If there is a requirement for engineered duct entries through the C3 boundary, they will be protected by backflow HEPA filters, with all penetrations through the boundary sealed.

The C5 areas in the LAW vitrification plant will comprise the following:

- LAW pour and cooling cells
- Tank rooms
- WESP rooms
- Finishing line through the swabbing cell

Air will be cascaded into the C5 areas and extracted by the C5 extraction system. Engineered duct entries (air in-bleeds) through the C5 confinement boundary will be protected by backflow HEPA filter isolation dampers, with all penetrations through the boundary sealed.

4.2.4.9. LAW Vitrification Plant Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. The LAW vitrification system design for construction will be completed and provided to Ecology. A complete list of completion schedule items is identified in Appendix 4A.

4.2.5. HLW Vitrification Plant

The HLW vitrification plant will consist of several process systems designed to perform the following functions:

- Hold pretreated HLW slurry
- Convert blended HLW slurry and glass formers into molten glass
- Treat melter offgas
- Handle IHLW containers

- Store IHLW containers
- Provide supporting equipment in the melter cave
- Handle miscellaneous waste
- Ventilate the HLW vitrification plant

Figure 4-26 presents the simplified PFD of the HLW vitrification plant. The purpose of this section is to describe the major systems associated with the HLW vitrification plant. Table 4-4 is a list of the HLW vitrification system numbers and corresponding engineering drawings.

Descriptions of the HLW vitrification process and vitrification offgas treatment systems are provided in sections 4.2.5.1 through 4.2.5.4. Descriptions of the IHLW glass container handling systems are in section 4.2.5.5. Descriptions of the melter cave support and miscellaneous waste handling systems are in section 4.2.5.6. Descriptions of the HLW vitrification plant ventilation systems are in section 4.2.5.7. Completion schedule information is presented in section 4.2.5.8. Engineering drawings and documents related to the HLW vitrification plant are identified in Appendix 4A.

4.2.5.1. HLW Melter Feed (HV Systems 110, 131)

The HLW melter feed system consists of concentrate vessels (HV System 110), a blended glass former feed hopper, and melter feed preparation and melter feed vessels (HV System 131). An illustration of the HLW melter feed systems is shown in Figure 4-27. An EDD of the system is identified in Appendix 4A.

The primary functions of this system will be to:

- Receive HLW feed slurry from the pretreatment plant
- Mix glass formers with HLW feed to form a uniform blend
- Provide a blended feed to the HLW melter

The HLW feed slurry will be transferred from the pretreatment plant to waste concentrate vessels (HV System 110). Process control samples will be collected from these vessels and analyzed to determine the glass former formulation. The glass-forming chemicals expected to be used include silica, boric acid, calcium silicate, ferric oxide, lithium carbonate, and sucrose. The HLW feed will be transferred from the concentrate vessels to the HLW melter feed preparation vessels (HV System 131), where it will be mixed with glass formers from the HLW blended chemical feed hopper to form a uniform slurry. This slurry will be transferred to the HLW melter feed vessel and then to the HLW melter (HV System 211).

4.2.5.2. HLW Melter (HV System 211)

An illustration of the relationship between the HLW melter system and the HLW melter feed systems (HV Systems 110 and 131) is shown in Figure 4-27. An EDD of the system is identified in Appendix 4A. The primary functions of the HLW melter system will be to:

- Convert blended waste slurry and glass formers into molten glass
- Deliver molten glass to IHLW containers
- Fill the containers with molten glass waste
- Monitor and control glass waste level during glass filling

Blended melter feed, consisting of glass formers and HLW feed slurry, will be received by the HLW melter from the HLW melter feed vessel (HV System 131). The melter will be remotely operated in a cave. The melter will be maintained at a negative pressure to the melter cave to ensure that any air leaks

are inward. The melter cave will also be maintained at a negative air pressure to the operating areas. The melter will be a refractory-lined rectangular tank with an outer steel casing. A water-cooled jacket will surround the exterior of the refractory to maintain a thermal gradient in the refractory material for corrosion control, to suppress outward migration of glass, and to reduce the heat load in the process cell.

The feed will be heated by passing an alternating electrical current between two electrodes in the glass pool, in a process known as joule-heating. Feed will be introduced to the melter as a slurry through nozzles in the melter lid. The water and volatile feed constituents will evaporate from the slurry to leave behind a layer of material known as the cold cap. New slurry will be added at about the same rate as the cold cap dissolves, maintaining a steady quantity of cold cap material. Waste feed components that remain in the cold cap will undergo chemical reaction, be converted to their respective oxides, and dissolve in the melt. Air injectors may be used to mix and agitate the molten glass.

Steam, entrained particulates, decomposition products, and volatile feed constituents will be released as offgas during the vitrification process. The offgas, along with air from inleakage, purges, and injections, will be routed to the HLW melter offgas treatment system (HV System 231). The discharge chamber will contain a trough connected to a pour head for pouring molten glass into containers.

The melter pour spout, located in the melter cave under each discharge chamber, will connect the melter discharge chamber with the IHLW container. The pour spout will serve as a conduit for molten glass passing from the melter discharge chamber to the IHLW container. A melter discharge bellows will provide a flexible seal between the melter discharge chamber and the pour spout mechanism. A knife valve assembly will seal the pour spout assembly when in the closed position. A slide gate will seal the melter discharge chamber during pour spout assembly change-out.

The level detection system will monitor and control the level of molten glass within the IHLW container as it is poured from the HLW melter spout. A thermal imaging system, using an infrared camera with associated software to provide glass level monitoring of the entire HLW container, is currently considered the best option for the primary system. Discrete point radiation detectors are currently considered the best option for the secondary system. To prevent "common mode failure", two separate operating systems will be used. Under normal operation, the monitoring system will be operated through the integrated control system (ICS). A "hard-wired" system will be used to back up the primary operation system and automatically shut down the filling activities. Additional information on the HLW melter is provided in section 4.3.3.

4.2.5.3. HLW Melter Offgas Treatment (HV System 231)

HV System 231 will consist of primary, standby and secondary systems, illustrated in Figure 4-28 and 4-29. An EDD of the system is identified in Appendix 4A. The primary functions of this systems will be to:

- Treat melter offgas prior to discharge to plant stack
- Collect and treat vessel ventilation streams
- Prevent melter pressurization

Primary Offgas Treatment

The primary melter offgas treatment system will consist of a SBS, a WESP, a HEME, and a HEPA filter. This system will cool the offgas and remove steam, entrained particulates, decomposition products, volatile constituents, and aerosols generated by the melter.

An air film cooler will reduce the temperature of the offgas. The offgas will then enter the SBS, where offgas bubbles will be drawn through a flooded packed bed, condensing steam, further cooling the gas, and removing larger particles, some aerosols, and soluble constituents greater than one micron.

Ionizing electrodes in the center of tubes within the WESP will create a strong electrical field that charges particulate matter entrained in the offgas stream. The charged particles will be removed from the offgas as they adhere to the oppositely-charged tube walls. The WESP will provide high-efficiency removal of sub-micron aerosols.

Offgas from the HLW vitrification C5 area vessel ventilation/offgas extraction system (HV System 770) will enter the HLW melter offgas treatment system between the WESP and the HEME. The combined stream will then be routed through the HEPA filers to remove entrained particulates. The HEME, a high-efficiency demister with a removal efficiency of about 99 percent for aerosols down to the sub-micron level, will further remove aerosols from the melter offgas stream and the vessel vent offgas. Aerosols will adhere to fiber packing filaments within the HEME by surface tension. As the droplets grow they will acquire enough mass to fall by gravity to the bottom of the unit, where they will be collected and drained. Condensate from the SBS and HEME and wash water from the WESP tubing will be collected in vessels and transferred by HV System 510 to the HLW pretreatment feed receipt vessels in the pretreatment plant (Section 4.2.2).

Standby Offgas Treatment

The standby offgas treatment system will consist of a backup air film cooler that provides an alternate route for offgas to the SBS. The standby line will be opened by a fast actuating butterfly valve and will route the offgas through the backup air film cooler prior to releasing it to the SBS. The primary offgas line will not be closed when the standby line is opened.

Use of the standby system is expected to be infrequent. This system will be actuated when the vacuum in the melter reduces, which may result from a constriction or plug in the primary line from the melter to the SBS, due to particulate buildup. It could also be caused by other abnormal situations, including a melter offgas surge in excess of the normal operational control limits of seven times condensable gases and three times non-condensable gases, or from a general electrical power failure. General power failures are estimated to occur on average once in 10 years, and the standby generators may take 15 to 30 seconds to come online. If the capacities of the primary and standby offgas treatment systems are exceeded and melter pressurization occurs during this power transition or during other abnormal situations, the excess offgas will be released into the melter cave to protect the melter. The melter cave will be ventilated as part of the HLW vitrification plant ventilation systems, and filtered through the HEPA filters prior to release in the HLW vitrification plant stack.

Secondary Offgas Treatment

The secondary HLW melter offgas treatment system will consist of a caustic scrubber and a thermal catalytic oxidizer. The caustic scrubber will cool the offgas, remove acid gases, and protect the downstream catalytic treatment unit. The offgas stream will move countercurrent to a trickling caustic liquid stream in the packed scrubber column. Liquid blowdown from the caustic scrubber will be

collected by HV System 510 and transferred to the pretreatment plant. The thermal catalytic oxidizer unit will destroy VOCs in the offgas stream. After completing this treatment train, the offgas will pass to the HLW vitrification plant ventilation system, where it will be treated by additional HEPA filtration before being released to the atmosphere through the HLW vitrification plant stack.

The HLW melter offgas treatment system will meet all applicable air regulations.

4.2.5.4. HLW Vitrification Plant Liquid Effluent (HV System 510)

The primary purpose of this system will be to receive, store, and transfer routine and non-routine LAW secondary effluent streams for treatment. Routine effluents are liquids or slurries routinely or periodically generated during vitrification. Non-routine effluents include vessel, equipment and cell washes; spills; vessel overflows; fire protection water discharges; and sump, floor drain and sink discharges. An illustration of the system is in Figure 4-30. An EDD of the system is identified in Appendix 4A.

This system will consist of four primary vessels: the LAW vessel, the acidic waste vessel, the plant wash and drains vessel, and the decontamination effluent collection vessel. The LAW vessel will receive effluent from the HLW offgas caustic scrubber and any steam condensate or floor drains. The HLW acidic waste vessel will receive SBS purge, WESP, HEME drainage and HLW feed transfer line flushes. The plant wash and drains vessel will receive all vessel and cell washwater from the HLW vitrification plant and C3/C5 area fire protection water discharges. The decontamination effluent collection vessel will receive IHLW container decontamination effluent. The effluents of all four HV System 510 vessels will be routed to the pretreatment plant.

4.2.5.5. IHLW Glass Container Handling (HV System 305, 310, 315, 320, 330, 340)

The IHLW glass container handling will consist of:

- HV System 305: Clean IHLW container import
- HV System 310: IHLW container handling and buffer store
- HV System 315: pour tunnel
- HV System 320: IHLW container weld, glass sampling, and rework
- HV System 330: IHLW container decontamination, swabbing and swab monitoring
- HV System 340: IHLW container storage and export

The individual systems and their primary functions are described below. EDDs identified in Appendix 4A provide additional detail.

<u>Clean IHLW Container Import (HV System 305)</u>

The main function of this system will be to provide the means of importing a clean container into the plant. Areas in the HLW vitrification plant, which will be supported by this system, include the container import truck bay, container import tunnel, and container interface into the container handling cave. The functions of container import include:

- Clean IHLW container receipt
- Clean IHLW container inspection
- Clean IHLW container storage
- IHLW container import into the handling cave

An overhead crane, stationed in the truck bay, will unload shipping containers from the transport truck. The shipping containers, each containing nine IHLW containers, will be placed in the staging area where receiving personnel will inspect the container packaging for any shipping damage. The crane will then remove an individual IHLW container from a shipping container and place it on the inspection/rotation table. The lid will be removed, and both the container and lid will be inspected for cleanliness, damage, and compliance with new product container specifications. Each container will be have a unique identification number that will be entered into the plant tracking system to allow tracking of the container throughout the plant.

After the container inspection, the inspection table will elevate the container into the vertical position. With the lid in place, the overhead monorail will transport the container to the import cell. At this point the container will either be set in the import buffer rack or placed in the import bogie staging for import into the import tunnel. Transportation through the hatch will be accomplished by the IHLW container handling and buffer store system (HV System 310).

IHLW Container Handling and Buffer Store (HV System 310)

The primary function of the IHLW container handling system will be to transport the IHLW containers to required locations within the container-handling cave at the HLW vitrification plant. Secondary functions of the system will include staging empty containers for filling and full containers for cooling; providing buffer storage, bogie and crane decontamination and maintenance; and exporting consumables.

IHLW containers will be transported within the container-handling cave by means of an overhead crane. A standby crane will be available in the event of the primary overhead crane failure. Leaded glass windows will be provided for viewing of equipment and operations within the cave area. Integrated networks of programmable logic controllers, which form part of the RPP-WTP ICS, will be used to control the mechanical handling. The network will contain a number of operator interfaces for cave face control or local control of mechanical handling equipment.

Pour Tunnel (HV System 315)

The main function of the pour tunnel will be to transport the IHLW containers between the IHLW container handling cave and the melter pour station. Secondary functions will include removing and replacing the container lid before and after pouring. This system will also be used to transport consumable waste, and provide bogie decontamination and maintenance.

This system will consist of a transfer tunnel containing various equipment, including a transfer and standby bogie rail system, lidding station and maintenance area. The tunnel will be located south of the melter cave.

Lidded, empty IHLW containers will be placed inside the container fill tunnel, using the container-handling cave crane (HV System 310), and loaded onto a bogie. The bogie will travel along rails to the lid-handling assembly, where the lid will be removed. The bogie will then position the container under the melter pour station, where the pour spout will attach to the container and fill it with glass. The container will remain at the pour station for a short cooling period to allow a "skin" to form over the glass, which will provide a seal to prevent additional offgassing. The bogie will then move the filled container back to the lidding device and the lid will be replaced. A stand-by bogie will be placed in position under the pour spout. After the lid has been replaced, the container will remain at the lidding device for additional cooling. The bogie will then return the filled container to the cave hatch for export to the HV System 310 buffer/cooling racks, for additional cooling in preparation for welding the lid in place.

IHLW Container Weld, Glass Sampling, and Rework (HV System 320)

This system will have these primary functions:

- Prepare container and lid surfaces for welding
- Weld IHLW container lid
- Return container to the IHLW container handling and buffer store system (HV System 310)
- Provide glass waste sampling assembly
- Perform IHLW container straightness, weight, and length checks
- Prepare the IHLW container for repairing defective welds
- Rework damaged IHLW containers as needed

The main purpose of HV System 320 will be to weld the container lid onto the container. In addition, the filled container length, diameter, straightness, weight, ability to stand unsupported, and ability to fit into the right-circular cylindrical cavity of the storage rack will be determined. All equipment will be remotely controlled through robotic or automatic operations. A load cell will be located between the overhead crane hook and the container grapple, to measure the weight of the containers. Typically, glass waste residue is not expected on the exterior of the container. However, prior to welding the lid on the container, the exterior of the container will be inspected, and if any glass is found it will be removed and disposed of as secondary waste.

The welding process will be automatic GTAW. Although the present intention is for the weld groove to be autogenous (no filler material), the welding equipment will be able to add filler material if warranted. The welding torch will have an arc voltage controlled head and the ability to remotely control the torch angle, travel speed, and travel direction. The welding parameters will be recorded and the finished weld will be visually inspected. Rejected welds may be repaired by re-melting the weld, mechanically removing the weld and re-welding, or welding a secondary lid over the primary lid. The sealed container will then be transferred to the IHLW container decontamination, swabbing, and swab monitoring system (HV System 330).

HV System 320 will also provide a glass sampling assembly. The glass on the surface will be sampled as it cools.

A rework system will be included in HV System 320, to prepare containers before repairing defective welds, removing residual glass, and reworking damaged IHLW containers, as required. The complete rework system will include, but not be limited to, the following:

- Weld defect removal equipment and controller
- Weld cleaning equipment and controls
- Maintenance tooling and racks
- HEPA vacuum
- Abrasive metal-cleaning equipment

Rework of weld defects in the container lids or complete replacement of defective lids will be performed remotely using robotic equipment as part of HV System 320. The rework equipment will machine out the weld defect area, or completely remove the weld. Metal dust and slag resulting from this operation will be removed using a localized HEPA vacuum, to minimize the spread of contamination.

Any glass spilled on the outside of the container will be removed by abrading the surface. A shield or catch tray will be placed around the container to catch any loosened glass shards and glass dust. Any

material caught in the tray will be removed using the localized HEPA vacuum and disposed of as secondary waste.

IHLW Container Decontamination, Swabbing, and Swab Monitoring (HV System 330)

The primary functions of the system will be to:

- Decontaminate the IHLW container
- Swab and monitor the IHLW container
- Decontaminate the HV System 330 equipment

The primary purpose of HV System 330 will be to remove contamination from the exterior surfaces of the IHLW containers. The IHLW container will always be managed above floor level in this system, either on a bogie or suspended by a crane.

A filled, cooled and welded IHLW container will initially be transported to HV System 330 on a bogie, and washed in a sealed area using medium-pressure demineralized water to remove any loose contamination. This water wash will be performed in a vessel mounted on a transfer bogie, which will travel from below the container-handling cell to below the decontamination and swabbing cave. After the water wash, the container will be transferred by means of a crane to a tank for further decontamination by chemically etching a thin layer of stainless steel from the container surface, using cerium ion (Ce^{4+}) in dilute nitric acid. The container will then be washed with nitric acid, followed by a second washing with de-ionized water. The container will remain in the tank to dry, while the decontamination fluids are pumped into a vessel containing a hydrogen peroxide solution to neutralize any remaining Ce^{4+}. Following neutralization, the fluid will be transferred to the plant waste stream and can be recycled back into the HLW melter feed system via pretreatment. The decontaminated container will be transported by overhead crane to the swabbing area.

After decontamination and drying, the container will be swabbed using an automated power manipulator. If the contamination is below acceptable limits, the IHLW container will be placed into a bogie located below the decontamination cell floor, which will transport it to the HV System 340 container storage/export cell. IHLW containers that exceed the contamination limits will be returned to the decontamination and swabbing station for further processing. All swabbing and monitoring results will be recorded.

IHLW Container Storage and Export (HV System 340)

The primary functions of this system will be to:

- Provide storage of the IHLW containers in storage racks
- Load the IHLW containers into the IHLW storage area
- Load the IHLW containers into shipping casks
- Evaluate shipping casks for contamination
- Load IHLW shipping casks into transport vehicles

The primary facilities associated with HV System 340 will include a container storage area, a shipping cask loading area, and a transport bay for container export. The decontaminated IHLW container will be transferred to the IHLW storage area using a bogie and an overhead crane. An IHLW container tracking system will retain required documentation such as the IHLW identification number, weight, and dimensions associated with the IHLW containers. CCTV cameras will provide general viewing of the

IHLW containers and the storage area. Descriptions of IHLW container inspections are provided in Chapter 6.

When the IHLW container is ready for exporting to an appropriate permitted facility, a dedicated transport vehicle will be dispatched to the IHLW transport bay. The empty shipping cask will be removed from the vehicle and placed on a shielded tunnel bogie system that will remove the cask lid and transfer the cask to the canister receiving station. The IHLW container to be transported will be visually inspected and its identification will be confirmed. After the operator has recorded the inspection information, the container will be lifted by overhead crane and placed into an individual shipping cask. The cask lid will be replaced and the shipping cask will be placed on the transport vehicle by an overhead crane. The container will be transported to an appropriate permitted facility after the cask exterior has been verified to be below the acceptable radioactive contamination level.

4.2.5.6. HLW Melter Cave Support and Maintenance (HV System 241, 270 420, 440, 450)

HLW melter cave support, maintenance and melter dismantling will consist of these systems:

- HV System 241: HLW melter cave support
- HV System 270: filter cave
- HV System 420: HLW melter transport
- HV System 440: HLW secondary waste container package
- HV System 450: HLW secondary solid waste container swabbing and monitoring, storage and export

The individual systems and their primary functions are described below.

<u>HLW Melter Cave Support (HV System 241)</u>

HV System 241 will provide remotely operated equipment to perform these support activities in the melter cave:

- Melter maintenance and replacement
- Melter component and consumable maintenance and replacement
- Melter component and consumable dismantling, sorting and loading
- Equipment decontamination and hands-on maintenance

The melter cave will contain the melter, melter feed preparation and feed vessels, and certain offgas system components. Overhead cranes, hoists, MSMs, and power manipulators will be the primary equipment used to carry out various replacement, size reduction and packaging tasks. Auxiliary tools will include impact wrenches, nut-runners, and hydraulic shears.

In addition, HV System 241 will provide the means to dismantle and reduce the size of spent melter components or consumables for export out of the cave in 55-gallon drums. Various size reduction tools will be used to cut down the equipment. The waste will be placed on a sorting table for screening and segregation prior to packaging and export.

Melter replacement will generally be preceded by an alternate glass removal step. Lid heaters will keep the glass pool at the desired temperature ranges. Air and vacuum lines will be inserted to draw the molten glass into an attached container. The failed melter will be disconnected and prepared for transport out of the cave.

A consumable bucket, equipped with interchangeable lid cutouts called templates, will be used to import and export melter consumables. HLW Melter feed system vessels will be organized such that power manipulators can disconnect connections and prepare failed vessels and components for export. Components of the HLW melter offgas system found in this cave will also be organized for similar activities.

HV System 241 will provide a crane decontamination room above the C3/C5 airlock, to allow for decontamination of equipment before hands-on maintenance in the crane maintenance area. In the decontamination room, the crane and equipment will be decontaminated with a demineralized high pressure wash water spray. Non-organic detergents or acid solvents may also be used, if needed. Wash water will be collected by a sump.

Filter Cave (HV System 270)

The HLW filter cave will house the equipment that provides C5 filtration for the HLW vitrification plant. Located within the cave will be the HVAC HEPA filter banks, HLW melter offgas HEPA preheaters, HLW melter offgas HEPA filters, and ancillary equipment and instrumentation. The primary functions of this system will be to provide the equipment and controls necessary for:

- Filtration of process area exhaust air
- Service, repair, and replacement of filters
- Size reduction and packaging of spent filters

Spent equipment and consumables will be moved into and out of the filter cave using bogies and cranes. Power manipulators and hoists will facilitate the movement of equipment within the filter cave. Shield doors will form a radiological barrier between the cave and the overhead crane maintenance area. The filter cave will be equipped with CCTV.

A power manipulator will be used for interfacing directly with filter lids, dampers, and elements during replacement of HEPA filters. Spent filters will be placed into a disposal basket at the filter compactor. A two-stage compact telescopic cylinder compresses the filter into the basket sized to fit inside 55-gallon drum on top of a drum transport bogie. Once the basket is full, it will be loaded into the drum and transported to the secondary solid waste container swabbing and monitoring, storage, and export area (HV System 450). Spray wash nozzles above the crane's locked position and a spray cabinet for the power manipulator will be used to ensure that the equipment is maintained in an uncontaminated state.

HLW Melter Transport (HV System 420)

The primary functions of this system will be to provide the equipment and controls necessary to:

- Transport new melter units into the HLW melter cave
- Remove spent melter units from the HLW melter cave
- Decontaminate and monitor the spent melter overpacks

A multi-axle transporter will be used to move a new overpacked HLW melter from the melter assembly building to the HLW vitrification plant loading dock. The overpacked melter will be offloaded, transferred through the rollup doors to the melter cave airlock, transferred through the airlock, and docked to the melter cave shield door. After opening the shield and overpack doors, the melter will be moved out of its overpack and installed in the melter cave, using the melter cave bogie.

The process of removing a spent HLW melter from the cave and loading it back into its overpack is the reverse of the installation. The overpack will provide a sealed, shielded disposal container for the spent melter. After the outside surfaces of the overpack have been checked for radiological contamination and decontaminated as required, the spent melter and its overpack will be moved through the melter airlock and placed on the transporter, to be moved out of the HLW vitrification plant through the rollup doors.

Decontamination of the overpack in the C3/C5 airlock, before it is exported, will be done manually using moist cloths. Water spray will also be provided as a contingency. The airlock will have stainless steel liner and a sump to collect any decontamination water.

If a failed melter requires additional breakdown prior to disposal, it will be transported to the failed melter storage area until the HLW vitrification plant operating conditions are suitable for the failed melter to be returned to the melter cave for breakdown.

HLW Secondary Solid Waste Container Packaging (HV System 440)

The primary function of this system will be to provide 55-gallon drums for removal of miscellaneous solid waste from the HLW melter cave and filter cave. Empty 55-gallon drums will be transferred into the drum transfer tunnel using the secondary solid waste container swabbing and monitoring, storage and export system (HV System 450).

At the melter cave, the drum will be positioned under the bagless transfer port and the drum transfer bogie will be locked into position. The drum will be raised using the through-wall drive to the cell flange, creating a seal between the melter cave and the drum, to maintain containment between the cave and the drum transfer tunnel. The cell door in the melter cave will latch onto the drum lid, forming a double door assembly which will then be opened by a hinged drive, exposing the interior of the drum to the melter cave atmosphere. A loaded waste basket will then be lowered into the drum using the HLW melter cave support system (HV System 241) equipment. Once the wastebasket has been loaded into the drum, the double door assembly will be closed and the container lid de-latched from the cell door. The drum will then be lowered and transferred to the drum lidding station, where the outer lid will be replaced and crimped onto the drum. The loaded drum will then be transferred to HV System 450.

At the filter cave, the drum will be positioned under the filter export well and the drum transfer bogie will be locked into position. The containment between the filter cave and the drum transfer tunnel will be maintained by an engineered air-gap between the top of the drum and the underside of the filter export well. A loaded filter basket will then be lowered into the drum, using the filter cave handling equipment. The drum will then be lowered and transferred to the drum lidding station, where the outer lid will be replaced and crimped onto the drum. The loaded drum will be transferred to HV System 450.

Secondary Solid Waste Container Swabbing and Monitoring, Storage and Export (HV System 450)

The primary functions of this system will be to:

- Transport filled and empty 55-gallon drums
- Provide external radiological monitoring of waste containers
- Decontaminate waste 55-gallon drums as required
- Assay 55-gallon drums to determine radiological inventory
- Supply and load 55-gallon drums into transport casks
- Transfer casks to the RPP-WTP CWS area

One of the main function of HV System 450 is to transport 55-gallon drums between the plant operating area and the swabbing and monitoring area within HV System 450. Prior to transporting to the RPP-WTP CWS area, the sealed drums will be swabbed for contamination along their bottom, sides and lid interface. Viewing windows will be positioned to allow for the evaluation of the swabbing process. The swabs will be monitored for radiological contamination in an external glovebox. If surface contamination exceeds the accepted limits, the drum will be repeatedly vacuum-cleaned, swabbed, and washed with wet swabs until the radiological limits have been met. Drums will be transported by means of an overhead bridge crane and drum grapple. The drums will be lowered through the swabbing and monitoring system floor hatch into an open transport cask. The cask lid will be replaced and the cask will be monitored for gamma radiation shine paths before it is transferred to the import/export area by means of the cask transfer bogie. The cask will then be transferred to the truck bay by an overhead crane for shipment to the RPP-WTP CWS area.

4.2.5.7. HLW Vitrification Plant Ventilation (HV Systems 710, 720, 730, 750, 770)

Primary factors in the design of the ventilation systems are the need to confine the sources of contamination to protect human health and the environment during normal and abnormal operating conditions. Barriers or barrier systems, including ventilation systems, contain and minimize the release of contaminants.

The HLW vitrification plant will be divided into four numbered zones (listed and defined below), with the higher number indicating greater radiological hazard potential and therefore a requirement for a greater degree of control or restriction. The ventilation system zoning will be based on the classifications assigned to building areas for potential contamination. Zones classified as C5 will be potentially the most contaminated and will include the container handling cell, C5 filter/offgas cave, melter cells, and glass pouring and cooling cells, all of which will be operated remotely. Zones classified as C1 will be uncontaminated areas that typically consist of normal offices and equipment rooms.

Confinement will be achieved by maintaining C5 areas at the greatest negative pressure, with air flow cascading from C2 to C3 areas and on to the C5 areas through engineered routes. The principle of a cascade system, in which air passes through more than one area, reduces the number of separate ventilation streams and hence the amount of air requiring treatment. Adherence to these principles in the design and operation of the waste treatment plant will ensure that the plant does not become a significant source of exposure to operators, and that the air emissions do not threaten human health and the environment.

HLW C1 Areas Ventilation (HV System 710)

C1 areas will typically consist of offices, workshops, control rooms, and equipment rooms. They will be slightly pressurized if they are adjacent to areas with higher contamination potential, to eliminate backflow from those areas.

HLW C2 Areas Ventilation (HV System 720)

C2 areas will typically consist of operating areas, equipment rooms, stores, access corridors, and plant rooms adjacent to areas with higher contamination potential. Air will be supplied to these areas by the C2 supply system, before being cascaded to C3 areas. Air in excess of what is cascaded will be removed by the C2 extraction system, to maintain a nominal negative pressure relative to outside atmosphere.

HLW C3 Areas Ventilation (HV System 730)

C3 areas will normally be unoccupied, but will allow operator access, for instance during maintenance. By virtue of their location and the activities performed within them, these areas will have an increased potential for the release of contamination. C3 areas will typically consist of filter plant rooms, workshops, maintenance areas, and monitoring areas. Air will generally be drawn from C2 areas via adjacent C2/C3 subchange rooms. Wherever possible, it will be cascaded through the C3 areas into C5 areas, or alternatively removed from the C3 areas by the C3 extraction system. When sufficient air cannot be cascaded into C3 areas, a dedicated C2 supply equipped with appropriate backflow prevention will be used.

HLW C5 Areas Ventilation (HV System 750)

The RPP-WTP C5 areas will be designed so that the cell or cave perimeter provides radiation shielding as well as confinement for ventilation purposes. The C5 areas in the HLW vitrification plant will comprise the following:

- HLW melter
- HLW pour or cooling cells and container handling cell
- C5 filter or offgas cell

Air will be cascaded into the C5 areas, generally from adjacent C3 areas, and extracted by the C5 extraction system. If there is a requirement for engineered duct entries through the C5 confinement boundary, they will be protected by back-flow HEPA filters, with all penetrations through the boundary sealed.

HLW Vitrification C5 area vessel Ventilation/Offgas Extraction (HV System 770)

The HLW vitrification C5 area vessel ventilation extraction system will draw air from the HLW melter offgas treatment system (HV System 231), filter it, and discharge it to the atmosphere via the HLW building exhaust stack. The system will consist of centrifugal exhaust fans and two stages of HEPA filters downstream of the secondary offgas treatment system (HV System 231). The vessel ventilation lines will be connected to the main vessel ventilation header. As shown on Figure 4-28, the main header will join the primary offgas treatment system lines (HV System 231) for the HLW melter downstream of the WESP and immediately before the HEME. The combined melter offgas stream and the vessel ventilation offgas stream will be treated in the remaining portion of the primary offgas treatment system and routed to the HLW secondary offgas treatment system (HV System 231).

4.2.5.8. HLW Vitrification Plant Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes the HLW vitrification system design for construction. A complete list of completion schedule items is identified in Appendix 4A.

4.2.6. Balance of Facility

The BOF will include, by definition, support systems and utilities required for the waste treatment processes within the pretreatment, LAW pretreatment, LAW vitrification, and HLW vitrification. Specific operational facilities will be established to provide the BOF support systems and utilities. These will include, but will not be limited to, heating and cooling, process steam, process ventilation, chilled

water, and compressed air. Local control panels will be provided in each building, with the main control room located at the pretreatment plant.

Unlike the waste treatment process areas, the BOF support systems and utilities will not be regulated under WAC 173-303, and this section is provided for information purposes only.

PFDs identified in Appendix 4A illustrate the support operations the BOF systems contribute to the RPP-WTP.

4.2.6.1. Process and Instrument Air (BF System 905, 910)

Illustrations of the process and instrument air systems are identified in Appendix 4A for BF System 905 and BF System 910. The compressed air system will provide a continuous supply of compressed air for the process tanks and vessels in the pretreatment, LAW pretreatment, LAW and HLW vitrification plants, and other miscellaneous users. Compressed air that has entered the process plants will not return to the BOF.

Essential users will include the following systems, components, or controls, which would be damaged by loss of air:

- Instrument air system
- The 150 psig users (ultrafiltration system)
- Melter support systems

The compressors will be located in the chiller/compressor building.

4.2.6.2. Cooling Water (BF System 945)

An illustration of the cooling water system is identified in Appendix 4A for BF System 945. The cooling water system supplies cooling water through the heat exchangers to equipment coolers and directs heat to the atmosphere. Cooling water removes heat from various plant equipment coolers in the process buildings and returns to direct this heat to a multi-cell mechanical draft-cooling tower.

The cooling water system uses three secondary loops to provide isolation from contaminated areas.

4.2.6.3. Low-Pressure Steam (BF System 975)

An illustration of the low-pressure steam system (BF System 975) is identified in Appendix 4A. This low-pressure (85 psig at 330 °F) system will provide a continuous supply of steam for various users in the pretreatment, LAW pretreatment, LAW and HLW vitrification plants. The process plant's main use of steam will be tank heating.

The low-pressure steam system will be supplied from the high-pressure steam system through pressure-reducing stations.

The steam condensate and feed system will collect condensate from the low-pressure steam users.

4.2.6.4. High-Pressure Steam (BF System 970)

An illustration of the high-pressure steam system (BF System 970) is identified in Appendix 4A. This system will provide a continuous supply of high-pressure (135 psig at 360 °F) steam for the ejectors in the

pretreatment, LAW pretreatment, and LAW and HLW vitrification plants. Once this steam enters the process buildings there will be no return streams to the BOF.

The steam plant will house the boilers that produce the steam.

4.2.6.5. Demineralized Water (BF System 645)

An illustration of the demineralized water system (BF System 645) is identified in Appendix 4A. This system will supply demineralized water to various plant locations, after drawing it off the process water system. Once the demineralized water enters the process buildings it will not return to the BOF.

The system will deliver demineralized water to process users in the following areas:

- Fresh ion exchange resin addition
- Wash rings
- Decontamination

4.2.6.6. Process Water (BF System 955)

An illustration of the process water system (BF System 955) is identified in Appendix 4A. This system will consists of water of a neutral pH that will be filtered to 10 microns. The process water will be chemically treated to protect the materials in the system from early degradation and provide for a 40 year life of the plant. This water will serve the following process systems:

- Pretreatment - cesium and technetium resin recovery
- Pretreatment - Pretreatment secondary offgas
- LAW vitrification - offgas quenching
- LAW vitrification - primary offgas treatment
- LAW vitrification - secondary offgas treatment
- LAW vitrification - emergency offgas treatment
- HLW vitrification - feed preparation and quenching
- HLW vitrification – primary and secondary offgas treatment
- Outcell process reagents
- Other miscellaneous process systems

Once the process water enters the process buildings it will not return to the BOF.

4.2.6.7. Chilled Water (BF System 950)

An illustration of the chilled water system (BF System 950) is identified in Appendix 4A. This system will supply chilled water to various air handling unit cooling coils and plant equipment coolers for the RPP-WTP.

The secondary circuits will be used to reduce the power consumption from pumps and prevent possible contamination from process equipment. Plate heat exchangers will separate the primary circuit from the process area secondary circuits. The primary circuit will return to the chiller/compressor building, where the chillers are located. Three secondary circuits will serve the pretreatment plant, LAW vitrification plant, and HLW vitrification plant.

No secondary circuits or booster pumps will be required for HVAC systems. HVAC systems for the following facilities will be connected directly to the primary chilled water circuit:

- Administration building
- Melter assembly building
- Switchgear buildings
- C2 supply air handling units (one for each of the four process areas)
- C2 recirculation air handling units (one for each of the four process areas)
- C5 recirculation air handling units (one for each of the four process areas)
- Non-process building C1 supply air handling units

4.3. Waste Management Units

The following section presents information on the waste management units that will be present at the RPP-WTP, as follows:

- Containers, including management and storage areas – section 4.3.1
- Tanks systems, for storage and treatment - section 4.3.2
- Miscellaneous units – section 4.3.3
- Containment buildings, which manage failed miscellaneous units and other wastes generated from the treatment processes – section 4.3.4

4.3.1. Containers [D-1]

This section of the application identifies the containers and container management practices that will be followed at the RPP-WTP. The term "container" is used as defined in WAC 173-303-040. Note that appendices and supplements to the DWPA use terms other than containers, such as canisters, boxes, bins, flasks, casks, and overpacks.

The container storage areas located in the pretreatment plant are:

- pretreatment plant container storage area no. 1
- pretreatment plant container storage area no. 2

There is one container storage area in the LAW pretreatment plant:

- LAW pretreatment container storage area

The container storage areas located in the LAW vitrification plant are:

- ILAW buffer container storage area
- ILAW container storage area
- LAW container storage area

The container storage areas located in the HLW vitrification plant are:

- IHLW container storage area
- HLW container storage area no. 1
- HLW container storage area no. 2

There are four container storage areas located in stand-alone buildings:

- Central waste storage area (referred to as the RPP-WTP CWS area in section 4.2)
- Melter storage area no. 1

- Melter storage area no. 2
- Miscellaneous dangerous waste storage area

The container storage areas at the RPP-WTP are summarized in Table 4-5.

4.3.1.1. Description of Containers [D-1a]

Four types of waste will be managed in containers:

- IHLW
- ILAW
- Miscellaneous mixed waste
- Miscellaneous dangerous waste

Immobilized Glass Waste

The immobilized glass waste is a mixed waste that will be managed in specially designed containers, which are stable during receipt of glass waste and capable of remote handling. Schematics of the example IHLW and ILAW containers are presented in Figures 4-31 and 4-32. Engineering drawings of the IHLW and ILAW containers are identified in Appendix 4A.

The LAW immobilized glass waste containers will be approximately 90 in. high and 48 in. in diameter, with a wall thickness of approximately 0.187 in. and a nominal capacity of 90 ft^3. The IHLW containers will be approximately 177 in. high and 24 in. in diameter, with a wall thickness of approximately 0.375 in. and a nominal capacity of 43 ft^3.

The immobilized waste glass containers will be constructed of austenitic (304L) stainless steel. Based on the results from the programs at Oak Ridge National Laboratory and Savannah River Technology Center, the 304L stainless steel is physically and chemically compatible with the glass waste. A demonstration of material compatibility by comparing the RPP-WTP glass waste with wastes generated at Oak Ridge and Savannah River is being conducted. The finalized results of this comparison will be submitted to Ecology.

Miscellaneous Mixed Waste

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

- Spent or failed equipment
- Spent dewatered ion exchange resins
- Offgas HEPA filters
- Melter consumables
- Laboratory waste
- Spent or failed melters

Spent equipment and offgas filters will typically be managed in commercially-available containers such as 55 gallon drums or steel boxes (5 × 5 × 9 ft, 4 × 4 × 8 ft, or 4 × 6 × 3 ft). The containers for miscellaneous mixed waste will comply with HSSWAC, and will be compatible with the miscellaneous mixed waste. These containers do not typically include a liner. Final container selection, container and waste compatibility, and the need for liners, will be determined as additional information on the waste types becomes available.

Spent dewatered ion exchange resins will be managed in containers that will be approximately 74 in. high and 60 in. in diameter. This waste will be generated and managed in the LAW pretreatment plant.

Melter consumables are routinely generated wastes, and include spent feed tubes, agitators, air spargers, pressure transducers, bubblers, and discharge risers. LAW melter consumables will be placed into steel bins approximately 95 × 95 × 120 in. HLW melter consumables will be placed into commercially available 55-gallon drums.

The LSM LAW melter is a RCRA miscellaneous unit within a container or overpack. The box containing the melter will serve as radiological shielding and as the final disposal container. When the LSM has reached the end of its operational life, it will be disconnected from all systems. Its openings will be sealed to provide complete containment. The design of the overpack will accommodate grouting. The spent or failed LSM will be approximately 27 ×15 ×16 ft high.

After a HLW melter is deemed to be waste it will be removed from service and placed in a steel container, the overpack. This will comply with the HSSWAC and will be approximately 21 × 18 × 16 ft high.

Each miscellaneous mixed waste container will have associated documentation that describes the contents, such as waste type, physical and chemical characterization, and radiological characterization.

All wastes will be packaged in containers with very limited quantities of liquids, or no free liquids at all. The exception may be laboratory wastes that could be mainly liquids. Most miscellaneous secondary mixed wastes will be spent equipment and consumables such as pumps, air lances, HEPA filters, etc. If necessary, these solid wastes will be treated to remove or absorb free liquids, to comply with the HSSWAC prior to transferal to a miscellaneous dangerous waste container storage area within the RPP-WTP.

Miscellaneous Dangerous Waste

Each miscellaneous dangerous waste container will have associated documentation that describes the contents, such as waste type and physical and chemical characterization. Typically, commercially available containers, such as 55-gallon steel drums, will be used. The types of containers for miscellaneous dangerous waste will comply with the HSSWAC. However, final container selection, container and waste compatibility, and the need for liners will be determined as additional information on the waste types becomes available.

Compliance Schedule

As the design of the RPP-WTP progresses, additional information on container compatibility with waste will be provided in this section. The proposed information completion schedule is identified in Appendix 4A.

4.3.1.2. Container Management [D-1b]

Immobilized Glass Waste Containers

All movement of the immobilized glass waste containers will be done remotely due to the high radiation content of the waste. A brief discussion on how the containers move through the RPP-WTP is presented below. The schematics of the locations for container storage are identified in Figures 4-33, 4-34, and 4-35.

ILAW Containers

An empty container will be transported to a LAW glass pour cave and placed on a turntable designed to hold three containers. There are two ILAW pour caves at each melter, each with the capacity to manage three containers at a time. The container will be sealed to the melter discharge with a pour head connection. The glass waste will fill the container during the course of approximately 15 to 20 hours. The filled container will cool for 10 to 30 hours to reach glass transition temperature (approximately 400 to 500 °C), which characterizes the transformation from an equilibrated melt to a "frozen" glass structure. At this stage, the waste glass does not contain liquid and is in a viscous state that ultimately stabilizes to a solid.

The cooled ILAW container will be lowered back onto the turntable and a temporary lid will be placed on it. The container will then be lifted by a remotely operated crane onto a bogie and transported to the ILAW buffer container storage area. The ILAW buffer container storage area will be approximately 22 × 63 × 20 ft high, and will have the capacity to store approximately 21 containers. The maximum volume of stored waste will be approximately 14,138 gallons. The containers will not be stacked.

The container will be transported to the ILAW container-finishing containment building unit (see section 4.3.4), where the level of waste glass will be measured and additional inert filler will be added, if needed, to fill the container. A sample of the glass may also be collected in this location prior to inert filling. The container will then be transported by bogie to the welding cell of the containment building unit. Any glass within the neck of the container will be removed by abrasion and the lid will be attached by GTAW to completely and permanently seal the container. The debris generated from residual glass removal will be collected with a vacuum system and disposed of as a secondary waste.

After welding is complete, the container will be moved to one of the two ILAW decontamination cells in the containment building unit, where contamination will be removed. Using a turntable, the container will revolve while a power manipulator tracks the entire surface with decontamination equipment. The dry decontamination process will use frozen carbon dioxide pellets. The container will then be transported to one of the two ILAW swabbing cells, where its surface will be swabbed with a soft absorbent material. The radiation levels of the swab will be remotely monitored, and the results will determine whether the ILAW container will go to the ILAW container storage area or through decontamination again.

A container may also be transported to the ILAW container fixative containment building unit, where a fixative will be sprayed onto the its surface to immobilize any radiological activity detected. The container will then be transferred to the ILAW fixative curing cell area, where the fixative will be allowed to set. Container rework may also occur in this area. The container will then be moved to the ILAW container storage area, which is 50 × 240 × 35 ft high and has the capacity to store approximately 460 containers. The maximum volume of stored waste will be approximately 309,672 gallons. The containers will not be stacked.

When the container is ready to be shipped out of the ILAW container storage area it will be transported to the export area, where it will be placed into a cask.

Table 4-5 summarizes the dimension and capacity of all ILAW container storage areas in the LAW vitrification plant.

IHLW Containers

The empty container will be remotely transported to one of the two IHLW pour stations. The container will be sealed to the melter pour spout with a pour head, and glass waste will fill the container during the course of approximately two days. After filling, a temporary lid will be placed on the container, which will be allowed to cool to glass transition temperature (approximately 400 to 500 °C), which characterizes the transformation from an equilibrated melt to a "frozen" glass structure, prior to transportation to the IHLW container weld containment building unit (see section 4.3.4).

The IHLW container will be transferred to the IHLW container weld containment building unit by means of an overhead crane. Here it will be stored on an open rack for up to three days, until it cools to normal operating temperature. In addition to providing a cooling area, the IHLW weld containment building unit can be used as a buffer to hold canisters awaiting lid welding or decontamination.

After it has cooled, the volume of glass in the container will be determined. The container will then be inspected for glass spatter on its exterior. If any glass is found it will be removed using a needle gun, and the debris generated will be collected with a vacuum system and disposed of as a secondary waste. The temporary lid will be removed and any residue on the lid or within the neck of the container will be removed by abrasion. The lid will be permanently attached by GTAW, to seal the container completely and permanently.

The sealed container will be transported to the IHLW container decontamination containment building unit. The containers are first rinsed with de-ionized water and then decontaminated using a cerium nitrate and nitric acid bath. It will then be rinsed with nitric acid, followed by a de-ionized water rinse, and then wiped or swabbed with a soft absorbent material. The radiation levels of the swab will be monitored.

The container will then be moved to the IHLW container storage area where it will be stored until transported off-site inside a shielded shipping cask. The IHLW container storage area will be approximately 67 × 23 × 27 ft high, and have the capacity to store approximately 50 containers. The maximum volume of stored waste will be approximately 16,082 gallons. The containers will not be stacked.

Table 4-5 summarizes the dimension and capacity of all IHLW container storage areas at the HLW vitrification plant.

Other IHLW and ILAW Container Storage Requirements

As stated under WAC 173-303-630(5)(c), a 30 inch separation is required between aisles of containers holding dangerous waste. In addition, WAC 173-303-340(3) requires a 30 in. separation to allow unobstructed movement of personnel, fire protection equipment, spill control equipment and decontamination equipment in an emergency. This requirement is considered unnecessary for container management procedures associated with the management of ILAW and IHLW at the RPP-WTP, and a waiver of these requirements is being requested.

This application proposes to space the stored ILAW approximately 4 to 6 in. apart. The spacing between IHLW containers will be approximately 12 to16 in. The reasons for requesting a waiver are as follows:

- Personnel access into the container storage areas will be restricted. High radiation dose rates from immobilized glass waste containers will preclude personnel entry into the process and storage areas, and inspection of the ILAW and IHLW containers will be performed remotely. (See Chapter 6 for inspection approach.)

- Water-based fire suppression systems will not be used in the container storage areas. Because of its inert nature, the glass waste will present a low fire hazard, and a minimal amount of combustible material will be present. The only potentially combustible material that may be present in the immobilized glass waste container storage areas is insulation on crane motors and associated cables. To ensure no water is introduced into the container storage areas, a dry chemical fire suppressant system may be installed.

- Spill control equipment will not be necessary within the container storage areas. Spills or leaks from the stored containers will not occur because the glass waste will be in a solid form and will not contain free liquid. The glass transition temperature characterizes the transformation from an equilibrated melt to a "frozen" glass structure. Preliminary estimates show that ILAW glass waste will cool to the glass transition temperature in 10 to 30 hours, while the cooling time will be less for the smaller IHLW containers.

The ILAW containers will be stored on the floor of the storage area. The IHLW containers will be stored in a storage rack to allow airflow. No stacking of the containers will occur in the ILAW or the IHLW container storage areas. CCTV cameras will enable general viewing of both areas.

Miscellaneous Mixed Waste Containers

Miscellaneous mixed waste will be managed in:

- Pretreatment container storage area no. 1
- Pretreatment container storage area no. 2
- LAW pretreatment container storage area
- LAW container storage area
- HLW container storage area no. 1
- HLW container storage area no. 2
- CWS area
- Melter storage area no. 1
- Melter storage area no. 2

Containers will be kept closed at all times when managed in the container storage areas. A protective coating will be applied to the concrete flooring of the container storage areas. Table 4-5 summarizes the dimensions and maximum capacity of all miscellaneous mixed waste storage areas.

Containers of mixed waste will be stored in pretreatment container storage area no. 1 or 2 until they are transferred to the CWS area. Containers holding LAW mixed waste will be stored in the LAW container storage area in the LAW vitrification plant until they are transferred to the CWS area. Containers holding HLW mixed waste will be stored in the HLW container storage area in the HLW vitrification plant until they are transferred to the CWS area

The pretreatment container storage area no. 1 will be located in the southwestern portion of the pretreatment plant. The L-shaped unit will be approximately 36 × 40 × 20 ft high, with an additional approximate 9 × 18 × 20 ft at the northwest corner. The aisle space will be 30 in., and waste containers will not be stacked more than two stacks high. The capacity of this area is approximately 48 waste boxes (4 × 6 × 3 ft high) or 126 of 55 gallon drums. The maximum storage volume will be approximately 119,830 gallons. The schematic of its location is shown in Figure 4-36.

The pretreatment container storage area no. 2 will be located in the southwestern portion of the pretreatment plant. The unit will be approximately 36 × 20 × 22 ft high. The aisle space will be 30 in., and waste containers will not be stacked more than two containers high. The capacity of this area is approximately 36 waste boxes (4 × 6 × 3 ft high) or 110 of 55-gallon drums. The maximum storage volume will be approximately 53,856 gallons. The schematic of its location is shown in Figure 4-37.

The LAW pretreatment container storage area will be located in the southwest portion of the LAW pretreatment plant. The unit will be approximately 70 × 10 × 23 ft high. The aisle space will be 30 in., and the waste containers will not be stacked. This unit will have the capacity to manage approximately ten containers. The maximum storage volume will be approximately 9,059 gallons. The schematic of its location is shown on Figure 4-38.

The LAW container storage area will be located in the western portion, on the main floor or ground level of the LAW vitrification plant. This L-shaped unit will be approximately 21 × 33 × 25 ft high, with an additional approximate 28 × 20 × 25 ft high. The aisle space will be 30 in., and the waste containers will not be stacked. This unit will have the capacity to store two drums and/or boxes. The maximum storage volume will be approximately 9,575 gallons. A schematic of its location is shown in Figure 4-34.

The HLW container storage area no. 1 will be located in the eastern portion of the main floor of the HLW vitrification plant and will be approximately 43 × 15 × 37 ft high. This unit will be used as a storage location prior to export of secondary waste containers out of the plant. Aisle space will be 30 in. and waste containers will not be stacked. This unit has the capacity to store 12 drums. The maximum storage volume will be approximately 660 gallons. A schematic of this unit is shown as Figure 4-35.

The HLW container storage area no. 2 will be located in the eastern portion on the main floor of the HLW vitrification plant, and will be approximately 20 × 33 × 25 ft high. The unit will be used to complete packing of the miscellaneous waste containers prior to storage in the CWS area. The aisle space will be 30 in., and waste containers will not be stacked. This unit will have the capacity to store two containers. The maximum storage volume will be approximately 110 gallons. A schematic of the location for the unit is shown on Figure 4-35.

The CWS area will be a stand-alone, metal-sided building with a metal roof and a concrete floor, located in the southern portion of the RPP-WTP. It will cover an area of approximate 120 × 80 ft, and will be approximately 16 ft high. The unit will manage secondary waste streams from the pretreatment, LAW and HLW vitrification plants. These waste streams will include miscellaneous spent equipment, maintenance waste, and spent or failed melter consumables. The aisle space will be 30 in. and waste containers will not be stacked higher than two containers. This unit will have the capacity to store approximately 2,880 of 55-gallon drums. The maximum storage volume will be approximately 718,080 gallons. The location of the unit is shown on Figure 4-39.

The melter storage area no. 1 will be a stand-alone building located in the southern portion of the RPP-WTP. It will have a metal roof, concrete floor, and concrete block walls and will be epoxy-coated. The unit will be approximately 70 × 45 × 35 ft high. The unit will be used primarily to manage up to two

spent melters. It may also receive containerized miscellaneous waste usually managed in the CWS area. Present within the unit will be winches and cranes to facilitate transport of the spent or failed melters. Aisle space will be 30 in. and the waste melters and miscellaneous waste containers will not be stacked. The maximum storage volume will be approximately 271,973 gallons. A schematic for the location of the unit is shown on Figure 4-39.

The melter storage area no. 2 will be a stand-alone building located in the southeast portion of the RPP-WTP. It will be comprised of a concrete pad, metal siding, and a steel truss and pressed steel panel roof. The building will be approximately 45 × 75 × 35 ft high. The unit will be used primarily to manage up to three failed melters. It may also receive containerized miscellaneous waste usually managed in the CWS area. Present within the unit will be winches and cranes to facilitate transport of spent or failed melters. The aisle space will be 30 in. Melters and miscellaneous waste containers will not be stacked. The maximum storage volume will be approximately 306,980 gallons. A schematic for the location of the unit is shown on Figure 4-39, and a drawing of the unit is identified in Appendix 4A.

Miscellaneous Dangerous Waste Containers

Miscellaneous dangerous waste containers will be managed in a stand-alone building (the miscellaneous dangerous waste container storage area). This container storage area will be a maximum of 25 × 30 ft, and will have a protectively-coated concrete floor and a 10 ft high metal roof. All containers will be kept closed unless waste is being placed inside them. They will routinely be moved by forklift or drum cart, and will be managed in a manner that prevents rupturing or leaking. The miscellaneous dangerous waste container storage area will hold eight 55-gallon containers. The containers may be stacked two high. The maximum storage volume will be approximately 440 gallons. The aisle spacing will be 30 in. A schematic of the location of the unit is presented in Figure 4-39.

4.3.1.3. Container Labeling [D-1c]

Immobilized Waste Glass Containers

Due to the radioactivity and remote handling of the immobilized waste containers, conventional labeling of the drums will not be feasible and a waiver from the standard labeling requirements is requested. This DWPA proposes an alternative labeling approach, using a unique alphanumeric identifier that will be welded onto each immobilized glass waste container. The welded "identifier" will ensure that the number is always legible, will not be removed or damaged during container decontamination, will not be damaged by heat or radiation, emits no gas upon heating when waste glass enters the container, and will not degrade over time.

The identifier will be welded onto the shoulder and side wall of each immobilized glass container at two locations 180 degrees apart, and will be approximately 2 in. high by 1.5 in. wide (See Figures 4-31 and 4-32 for examples of these identifiers). The identifier will be formed by welding on 308L stainless steel filler material at the time of container construction. This identifier will be used to track the container from receipt at the RPP-WTP, throughout its subsequent path at the RPP-WTP, until it leaves the plant to be disposed of or stored.

Each identifier will be composed of eight coded alphanumeric characters. For example, HL123456 would be an immobilized waste glass container storing Hanford LAW with the unique number 123456, and HH123456 would denote an IHLW container. Additional information regarding the tracking for the identifiers and containers will be provided in accordance with the completion schedule, identified in Appendix 4A.

Personnel access into the immobilized glass waste container storage areas will be limited and controlled administratively. Signs designating the hazards associated with the immobilized waste glass will be posted at appropriate locations outside the container storage areas.

Miscellaneous Mixed Waste Containers

The miscellaneous mixed waste containers will be labeled with the accumulation or generation start date, as appropriate, and with the words "hazardous waste" or "dangerous waste". A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that all required information is visible. The label will meet the WAC 173-303-630(3) requirements, and the dangerous waste number will be clearly identified.

The labels on the overpack for the spent or failed melters will carry the accumulation or generation date, and will state the words "hazardous waste" or "dangerous waste". A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that all required information is visible, and the dangerous waste number will be clearly identified.

Miscellaneous Dangerous Waste Containers

The miscellaneous dangerous waste drums will be labeled with the accumulation or generation start date, as appropriate, and will state "hazardous waste" or "dangerous waste". A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that all required information is visible. The label will meet the WAC 173-303-630(3) requirements, and the dangerous waste number will be clearly identified.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided will include a description of the container tracking. The proposed information completion schedule is identified in Appendix 4A.

4.3.1.4. Containment System Description

The wastes managed in the immobilized waste container storage areas, and the limited amount of other materials present in the majority of the container storage areas, do not require secondary containment, as discussed below.

4.3.1.4.1. Secondary Containment System Design [D-1d(1)]

ILAW and IHLW

Secondary containment is required for areas in which containers hold free liquids, or wastes with the designations F020, F021, F022, F023, F026, or F027, whether or not the wastes contain free liquids. It is also required for areas managing wastes exhibiting the characteristic of ignitability or reactivity as defined in WAC 173-303-090(5) and (7). These requirements do not pertain to the ILAW and IHLW container storage areas, as these containers will not contain free liquids or wastes with the designations F020, F021, F022, F023, F026 or F027, or wastes that are designated ignitable or reactive.

Miscellaneous Mixed Waste

Secondary containment is required for areas in which containers hold free liquids or wastes with the designations F020, F021, F022, F023, F026, or F027, whether or not the wastes contain free liquids. It is also required for areas managing wastes exhibiting the characteristic of ignitability or reactivity as defined in WAC 173-303-090(5) and (7). These requirements do not pertain to the pretreatment container storage areas nos. 1 and 2, LAW container storage area or the HLW container storage area, as the containers managed in these areas will not contain free liquids, wastes with the designations F020, F021, F022, F023, F026 or F027, or wastes that are designated ignitable or reactive.

The LAW pretreatment container storage area will manage dewatered resins from the technetium and cesium ion exchange processes. The waste is expected to contain less than one percent water in volume, therefore a secondary containment system is not required. However, a sump will be provided as a contingency.

The CWS area may receive wastes that contain free liquids or are incompatible. Containers with free liquids will be provided with secondary containment, and will rest on portable secondary containment sumps that can hold 110 percent of the volume of the container. Wastes that do not contain free liquids or other disqualifying wastes will not require secondary containment. Incompatible waste will be managed in accordance with appropriate requirements.

The melter storage areas nos. 1 and 2 will typically be used for managing only spent or failed melters, and no sumps will be constructed in these units. If waste containing liquid is placed in these units, each waste container will rest over a portable secondary containment sump that can hold 110 percent of the volume of the container.

Miscellaneous Dangerous Waste

Wastes that do not contain free liquids or other disqualifying wastes will not require secondary containment. Containers with free liquids will be provided with secondary containment in the form of portable secondary containment sumps made of high-density polyethylene. The secondary containment sumps will have a capacity of approximately 63 gallons and will have approximately 0.25 in. thick walls and a two-way forklift entry.

4.3.1.4.2. System Design [D-1d(1)(a)]

ILAW

There will be two container storage areas for the ILAW containers in the LAW vitrification plant, as follows:

- ILAW buffer container storage area
- ILAW container storage area

Both the ILAW container storage areas will be located in the LAW vitrification plant, which is designed to be seismically qualified (see the SADAR, identified in Appendix 4A). A secondary containment system will not be needed because the immobilized glass waste will not at any time contain free liquid. In addition, because free liquid is not expected within the ILAW container storage area, the floor will not be sloped and will not contain drains or sumps. A sump and sloped floor is provided in the ILAW buffer container storage area as a contingency.

Free liquid will not be present within the ILAW container storage areas for the following reasons:

- Administrative controls will ensure free liquid does not enter or condense inside filled ILAW containers.
- The ILAW container storage areas will be completely enclosed within the LAW vitrification plant.
- The roof of the LAW vitrification plant will be metal roofing, roof insulation, and a vapor barrier.
- All penetrations to the storage areas will be sealed to prevent water ingress.
- Rainwater will be directed away, using roof drains.
- Schematics of the ILAW container storage areas are shown in Figures 4-33 and 4-34.

IHLW

There will be one container storage area for the IHLW containers in the HLW vitrification plant, as follows:

- IHLW container storage area

The IHLW container storage area will be located in the HLW vitrification plant, which is designed to be seismically qualified (see the SADAR, identified in Appendix 4A). A secondary containment system will not be needed because the immobilized glass waste will not contain free liquid. In addition, because free liquid will not be present in the IHLW container storage area, the floor will not be sloped and will not contain drains or sumps.

Free liquid will not be present within the IHLW container storage area for the following reasons:

- Administrative controls will ensure that free liquid does not enter or condense inside filled IHLW containers.
- The IHLW container storage area will be completely enclosed with a metal roof .
- All penetrations to the storage area will be sealed to prevent water ingress.
- Rainwater will be directed away using roof drains.
- A schematic of the IHLW container storage area is shown in Figure 4-35.

Miscellaneous Mixed Waste

There will be nine miscellaneous mixed waste container storage areas at the RPP-WTP, as follows:

- Pretreatment container storage area no. 1
- Pretreatment container storage area no. 2
- LAW pretreatment container storage area
- LAW container storage area
- HLW container storage area no. 1
- HLW container storage area no. 2
- CWS area
- Melter storage area no. 1
- Melter storage area no. 2

The pretreatment container storage areas nos. 1 and 2, the LAW container storage area, and the HLW waste container storage areas nos. 1 and 2 will be located within the pretreatment, LAW pretreatment, LAW or HLW vitrification plants, respectively. Therefore, these units will be completely enclosed within the plants, which will have metal roofing, roof insulation, and a vapor barrier. All penetrations to the storage areas will be sealed to prevent water ingress, and rainwater will be directed away using roof drains.

The pretreatment container storage areas nos. 1 and 2, and the LAW pretreatment container storage area are expected to manage waste that does not contain free liquid. Secondary containment is not expected to be required. If the waste is found to contain free liquid, secondary containment will be provided.

The CWS area will be a metal-sided building with a concrete floor sloped to a grated sump. Secondary containment sumps will be provided for individual containers. The perimeter of the concrete floor will have a six in. concrete curb. Access to the building will be through two rollup doors capable of allowing forklift access, and one personnel door.

Melter storage area no. 1 will be a roofed concrete block building with a concrete floor. The floor and the concrete block wall will be epoxy-coated. Melter storage area no. 2 will be a roofed metal building with a concrete floor. These areas will not routinely hold liquid waste. If liquid waste is managed here, secondary containment sumps will be provided for individual containers.

Miscellaneous Dangerous Waste

Waste containing free liquid may be present in the miscellaneous dangerous waste storage area. Each container holding miscellaneous dangerous waste with free liquids will be provided with a portable polyethylene sump. The waste container will function as the primary containment, while the portable container will function as the secondary containment. The secondary containment sumps will have a capacity of approximately 63 gallons, and will have approximately 0.25 in. thick walls and provision for two-way forklift entry.

4.3.1.4.3. Structural Integrity of the Base [D-1d(1)(b)]

ILAW and IHLW Container Storage Areas

The ILAW and IHLW container storage areas are located in the vitrification plants, which are being designed. An engineering evaluation, certified by an independent professional engineer, will be provided when the designs are finalized. The information to be provided will include calculations that demonstrate that the storage areas will be constructed to support all storage and transportation of containers within the container storage areas.

Miscellaneous Mixed Waste

An engineering evaluation, certified by an independent professional engineer, will be provided when the designs are finalized.

Miscellaneous Dangerous Waste

An engineering evaluation, certified by an independent professional engineer, will be provided when the design is finalized.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. The information that will be provided will include certification of the structural integrity of the base of all the container storage areas. The proposed information completion schedule is identified in Appendix 4A.

4.3.1.4.4. Containment System Capacity [D-1d(1)(c)]

ILAW and IHLW

Because free liquids will not be present in the containment system for these three units (see section 4.3.1.4.2), a containment system capacity demonstration is not required.

Miscellaneous Mixed Waste

The pretreatment container storage areas nos. 1 and 2, LAW container storage area, and HLW container storage areas nos. 1 and 2 do not require secondary containment, because no liquids will be managed in these units. Secondary containment is not expected to be required. If the waste is found to contain free liquid, secondary containment will be provided.

Liquid waste may be stored in the CWS area and melter storage areas nos. 1 and no. 2. Individual 55-gallon drums which contain free liquid will be stored on portable secondary containment sumps, which will have an approximate capacity of 63 gallons.

Miscellaneous Dangerous Waste

Waste containing free liquid may be present in the miscellaneous dangerous waste container storage area. Each container holding miscellaneous dangerous waste will be placed into a portable secondary containment sump. The waste container will function as the primary containment while the portable sump will function as the secondary containment. Each portable sump container will have the capacity to hold at least 110 percent of the volume of the primary waste container. Typically, the waste containers will be 55-gallon drums and the nonpermanent polyethylene secondary containers will have a capacity of approximately 63 gallons.

4.3.1.4.5. Control of Run-on [D-1d(1)(d)]

ILAW and IHLW

The ILAW and IHLW container storage areas will be located in the LAW and HLW vitrification plants. The requirements for this section do not apply because the immobilized glass waste container storage areas will not be exposed to run-on.

Miscellaneous Mixed Waste

Runoff will not reach the interior of the miscellaneous mixed waste storage areas, because they will all be located within buildings, which will have roof gutters to remove precipitation.

Miscellaneous Dangerous Waste

Run-on will not reach the interior of the miscellaneous dangerous waste container storage area, because it will be a stand-alone building with walls and roof gutters to remove precipitation.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. The information that will be provided will include drawings showing the roof drainage of the container storage areas. The proposed information completion schedule is identified in Appendix 4A.

4.3.1.4.6. Removal of Liquids from Containment System [D-1d(2)]

ILAW and IHLW

No liquids will be present in the containment system; therefore, the requirements of this section do not apply to the immobilized waste glass container storage areas.

Miscellaneous Mixed Waste

Portable secondary containment sumps will be provided for individual 55-gallon containers that contain free liquids. Hand pumps or similar devices will be used to remove any liquid released to the portable secondary containment sumps.

Miscellaneous Dangerous Waste

Portable secondary containment sumps will be provided for individual 55-gallon containers that contain free liquids. Hand pumps or similar devices will be used to remove any liquid released to the portable secondary containment sumps.

4.3.1.4.7. Demonstration that Containment is not Required because Containers do not Contain Free Liquids, Wastes that Exhibit Ignitability or Reactivity, or Wastes Designated F020-023, F026 or F027 [D-1e]

ILAW and IHLW

The ILAW and IHLW container storage areas will not contain liquids. The vitrification process volatilizes water or other liquid materials existing at ambient conditions in the waste slurry feed that enters the melter.

The waste numbers for ignitability (D001) and reactivity (D003) will not be managed in the immobilized glass container storage areas. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system unit. Therefore, these waste numbers will not be present at the RPP-WTP.

Miscellaneous Mixed Waste

Liquids may be present in wastes in the CWS area, the melter storage areas nos. 1 and 2, and the miscellaneous dangerous waste container storage area. Secondary containment will be provided for individual containers that manage free liquids. The waste numbers for ignitability (D001) and reactivity (D003) will not be managed in the miscellaneous mixed waste storage areas. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system unit. Therefore, these waste numbers will not be present at the RPP-WTP.

Miscellaneous Dangerous Waste

The miscellaneous dangerous waste container storage area may manage liquids and D001 and D003 waste, therefore secondary containment will be provided. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system unit. Therefore, these waste numbers will not be present at the RPP-WTP.

4.3.1.4.8. Prevention of Reaction of Ignitable, Reactive and Incompatible Wastes in Containers [D-1f(1)]

ILAW and IHLW

Immobilized glass waste will not be ignitable, reactive, or incompatible with the wastes managed in the ILAW and IHLW container storage areas. The requirements of this section are not applicable to the immobilized glass waste containers, including spent or failed melters.

Miscellaneous Mixed Waste

Potentially incompatible wastes are not expected to be managed in the miscellaneous mixed waste storage areas. If such wastes are managed here, the containers of incompatible waste or chemicals will not be stored in close proximity to each other. Acids and bases will be stored on portable secondary containment sumps; oxidizers will be stored in areas separate from combustible materials; and corrosive chemicals will be stored on a separate secondary containment sump. These separate storage areas within the unit will be clearly marked with signs indicating the appropriate waste to be stored in each area. All potentially incompatible waste will be stored at least one aisle width apart.

Miscellaneous Dangerous Waste

Potentially incompatible waste (e.g., acidic and base waste) may be stored in the miscellaneous dangerous waste container storage area. Containers of incompatible waste or chemicals will not be stored in proximity to each other. Acids and bases will be stored in areas with separate secondary containment sumps, oxidizers will be stored in areas separate from combustible materials, and corrosive chemicals will be stored in a separate secondary containment sump. These storage areas will be clearly marked with signs indicating the appropriate waste to be stored in each area. All incompatible waste will be stored at least one aisle width apart.

4.3.2. Tank Systems [D-2]

This section contains descriptive information for each tank system used for managing mixed waste. The term "tank systems" refers to mixed waste storage or treatment tanks and their associated ancillary equipment and containment systems. The general arrangement drawings identified in Appendix 4A depict the locations of tank systems at the RPP-WTP. Current PFDs for tank systems are also identified in Appendix 4A.

The following text uses the terms vessel and tank. The term "vessel" is an engineering term and denotes more robust construction than a typical mixed waste storage or treatment tank. The term vessel is included due to the use of the term in the American Society of Mechanical Engineer (ASME) codes and specifications, which will be followed, for most tank construction at the RPP-WTP.

4.3.2.1. Design, Installation and Assessment of Tank Systems [D2a]

This section describes the attributes of tank systems that will contain mixed waste. Tanks and ancillary equipment containing only additives or reagents, such as glass-forming chemicals, precipitation reagents, or unused resin are not regulated under RCRA or the WAC 173-303 regulations, and are therefore not included.

Tank systems that will contain mixed waste are designed to comply with worst-case scenarios, such as extreme pH, temperature, and pressure conditions. The RPP-WTP will be an entirely new construction and there will be no "existing tanks" in the plant. All tank systems, with the exception of the three outside tanks at the LAW pretreatment plant, will be located indoors and within process cells, process rooms, or caves with controlled access.

4.3.2.1.1. Design Requirements [D2a(1)]

Most of the tanks which come in contact with the waste will be operated under atmospheric pressure conditions at the RPP-WTP. All of the mixed waste tanks will be designed, at a minimum, to ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 (ASME Section VIII code), the American Petroleum Institute (API) Code, or good engineering practices. Tank integrity will be reinforced by additional requirements of the tank group and seismic category assignment to each tank. Five vessel or tank groups will be designated to accommodate the variations in design criteria and safety requirements of the RPP-WTP. Groups 1 through 3 will be high-integrity vessels and will be located within cells or caves. Group 4 will be medium-integrity and Group 5 will be constructed to commercial standards. Some general vessel or tank design requirements are summarized as follows:

- The minimum thickness of uncorroded cylindrical shell and dished head will be determined based on the vessel diameter, as summarized below:
- Vessel diameter is less than or equal to 6 ft: 0.25 in.
  - Vessel diameter is greater than 6 ft but less than 10 ft: 0.3125 in.
  - Vessel diameter is greater than 10 ft but less than or equal to 20 ft: 0.4375 in.
  - Vessel diameter is greater than 20 ft but less than or equal to 26 ft: 0.5625 in.
  - Vessel diameter is greater than 26 ft but less than or equal to 30 ft: 0.625
- The minimum skirt thickness will be determined based on the vessel diameter, as summarized below:
- Vessel diameter is less than or equal to 4 ft: 0.1875 in.
  - Vessel diameter is greater than 4 ft but less than or equal to 7 ft: 0.25 in.
  - Vessel diameter is greater than 7 ft but less than or equal to 10 ft: 0.3125 in.
  - Vessel diameter is greater than 10 ft: 0.375 in.
- The minimum anchor bolts, where used, will be 0.75 in. Unified National Coarfe (UNC) in diameter.
- Three types of tank supports may be used: skirts, saddles and legs.
- Minimum wall thickness for a nozzle neck or other connection (including access and inspection openings) will comply with the requirements of ASME Code paragraph UG-45.
- The vessels will be designed for seismic loading in accordance with the uniform building code (UBC) standard for Zone 2B.

- The codes and standards that will be followed for design, construction and inspection for the tanks are identified below:

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society of Non-Destructive Testing
ASTM	American Society of Testing Materials
EPA	Environmental Protection Agency
NBBPVI	The National Board of Boilers and Pressure Vessel Inspectors
OSHA	Occupational Safety and Health Administration
PFI	Pipe Fabrication Institute
UBC	Uniform Building Code
WRC	Welding Research Council

4.3.2.1.2. Materials of Construction

Materials of construction will comply with consensus-recognized specifications. The material of construction used for tanks and vessels in the RPP-WTP will consist predominantly of stainless steel. An evaluation of the corrosion potential and protection requirements for the vessel or tank systems titled *Waste Compatibility and Structural Integrity of System Vessel s and Piping* is provided with this application (see Appendix 4A for the location of the report).

4.3.2.1.3. Physical Information for Tanks

Tables 4-6 through Table 4-9 list current tank design information (capacity, materials of construction, and dimensions). The tank systems are grouped by plant and process system.

It should be noted that as engineering optimization efforts continue, the physical data such as tank dimensions and tank capacity may be modified.

Tank operation is generally automated. However, operator intervention can be used when human decisions or approval are required for initiation and termination of a process operation. Descriptions of tank system operation for major RPP-WTP process systems are identified in Appendix 4A.

As the design of the RPP-WTP progresses, additional information on final tank designs will be provided in this section. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.2. Ancillary Equipment Requirements [D-2a(1)]

Information concerning ancillary equipment is provided in the following subsections.

4.3.2.2.1. Transfer or Pressure Control Devices

Several fluid transfer devices will be used in the RPP-WTP. These devices include: mechanical pumps, RFDs, and steam ejectors. Breakpots and seal pots, although not fluid transfer devices, are an important component of vessel operations. These components are discussed in the following sections.

Mechanical Pumps

Mechanical pumps will be used for operations that require high-flow pumps (such as through the evaporator circuits) or high-pressure head pumps (such as for pumping a waste stream through ultrafiltration circuits). Mechanical pumps will be located in process cells, process rooms or caves. In general, mechanical pumps will be repaired in place, or removed to a maintenance area. However, remotely maintained pumps will be used in areas where maintenance activities would result in a significant radiation dose to the operators. Figure 4-40 shows the main components and operating geometry of a typical mechanical pump that can be remotely maintained.

For normal process operating sequences, mechanical pumps and associated valves will be controlled by the ICS. In systems where off-normal conditions would require pump shutdown, the design will include an alarm mechanism which will also trip the transfer device. The pump system is designed to allow for the drainage of liquid from the pump, and for the introduction of flush liquids at the end of transfers to reduce residual contamination.

Reverse Flow Diverters

RFDs will provide for the maintenance-free pulsed or metered transfer of liquids or slurries throughout the treatment process. A RFD does not need to be fully submerged in order to remove the contents of a vessel, and it maintains a small and predictable volume of tank contents following the use. Operation of the RFD is cyclical, following timed phases: suction phase, drive phase and blowdown. Figure 4-41 and following paragraphs describe a typical RFD system arrangement. Figure 4-42 illustrates a typical flow diverter.

Suction phase: In the suction phase, the secondary automatic valve A is open, admitting air to the suction jet pump. Valve B is shut and liquid is drawn from the supply tank through the RFD and into the charge vessel. The suction ejector is designed so that it cannot produce a vacuum capable of lifting liquid higher than a certain valve known as the "suction lift". After a short time, the liquid reaches this "suction lift" height and stops, then valve A is shut.

Drive phase: When valve A is shut, valve B is opened, admitting air to the drive nozzle. Air passes through the nozzle and pressurizes the charge vessel. Liquid is forced across the RFD and into the delivery pipe. The delivery pipe is quickly filled with liquid that flows into the delivery vessel.

Blowdown phase: When the charge vessel is nearly empty, valve B is shut; no air is supplied to either jet pump. The compressed air in the charge vessel passes back through the paired jet pumps, down the vent pipe and into vessel vent system.

Shortly after blowdown begins, the pressure in the charge vessel falls below the delivery head and the flow of liquid into the delivery vessel is halted. The liquid in the delivery vessel then falls back down the pipe, across the RFD, and into the charge vessel. After a short time, the pressure in the charge vessel falls to zero (gauge). The cycle is now complete.

Steam Ejectors

Steam ejectors are used to transfer process liquids, or to reduce the operating pressure of a system by gas removal. They empty liquid from vessels by means of suction lift, using a simple control system. A typical arrangement of a steam ejector system is shown in Figure 4-43.

An automated control valve supplies high-pressure steam to the steam ejector. This steam accelerates through a nozzle, creating a differential pressure along a submerged suction leg within the vessel. The pressure than forces the liquid up the suction pipe. This effect is known as striking. The steam then conveys the liquid to the destination vessel, normally via a breakpot. Control is established using liquid level instrumentation in the vessel being emptied, and using a temperature indicator, such as a thermocouple, within the breakpot.

Seal Pots

A seal pot is one type of hydraulic seal. A hydraulic seal is used primarily to maintain a separation between vessel vent or off gas systems for feed and receipt vessels. This separation is necessary to prevent migration of airborne contamination between the vessels. Without the seal, airflow could occur due to the different pressures in the vent systems. The seal is a slug of liquid in the interconnecting pipework that remains after each liquid transfer is completed, blocking airflow between vessels.

The seal can be provided by constructing a simple "U" shape in the piping. Different piping arrangements are used for different purposes. A seal pot is a small vessel with one (inlet or outlet) pipe submerged in the liquid slug in the lower part of the pot, while the other pipe terminates in the top of the pot, above the static liquid level. The pot may be provided with a level indicator or alarm, if necessary, to ensure adequate liquid level. Periodic liquid additions may be needed to maintain the seal, especially if the pipeline is infrequently used. Figure 4-44 illustrates a typical seal pot.

Breakpots

The main function of the breakpot is to reduce the amount of radioactive material entrained into the vessel ventilation system. Breakpots are provided on transfer lines that use steam ejectors for moving radioactive liquors by pressure flow. These types of transfers create the potential for higher containment of radioactive contamination. Breakpots function to convert steam from pressure-flow to liquid gravity flow, thereby reducing both the effluent loading on the downstream vessel ventilation treatment system and the radioactive contamination levels in the vessel vent ductwork. Breakpots also serve a secondary purpose by providing a siphon break for other transfer systems where siphoning could occur. A diagram of a breakpot is shown in Figure 4-45.

The breakpot will be placed at a high point in the discharge line from the steam ejector. Liquid will be pumped into the breakpot through an inlet nozzle in its wall. The incoming liquid will be directed towards a baffle. Within the baffle, any non-condensed steam and gases will disengage. The breakpot will be self-draining; the liquid will drain through the breakpot discharge pipe to the destination vessel.

Above the inlet nozzle(s) will be a packed bed where disentrainment of the gas stream will occur. The exiting gas from the packed section will pass into the vessel ventilation system. The packed bed can be washed periodically using a wash ring permanently installed above the packed bed. Within the packed bed, a thermocouple will be located inside a sheath to measure temperature.

4.3.2.2.2. Description of RPP-WTP Piping System

Interplant Piping

Transfer Lines

Waste from the DST system unit will be transported to the RPP-WTP via the HLW and LAW transfer lines.

The HLW transfer line will be a double-walled pipe. The inner pipe will be constructed of stainless steel, while the outer pipe will be constructed of carbon steel. A leak detection system will be provided for the entire length of the HLW transfer line. Pumping will be terminated, and reception of waste feed from the DST system unit will stop, when a leak is sensed by the leak detection system.

The inner pipe will be supported by guides, saddles, support keys, or anchors within the outer pipe. The inner pipe will transport waste and maintain the pressure boundary, while the outer pipe will provide secondary containment for the inner pipe. The piping system will be buried under a minimum depth of soil for radiation shielding. The minimum depth of soil will be finalized at the detail design phase and will be not less than the 2 ft. freeze depth. A heat trace system is not required for pipes buried below freeze depth.

The piping system will have a continuous slope down toward the pretreatment plant. Any released liquids resulting from leaks to the outer pipe can be removed as required by WAC-173-640(4)(b). The piping system will be designed to allow water flushing to occur in both directions.

The LAW transfer line will also be a double-walled, buried pipeline and will be similar in design to the HLW transfer line.

Liquid Effluent Transfer Lines:

Liquid effluent generated at the RPP-WTP will be routed to the pretreatment or the LAW pretreatment plants for recycling through the RPP-WTP or disposal to the LERF and ETF. An effluent line will be routed from the LAW pretreatment plant to the LERF and ETF. This line will be a buried stainless steel double-walled pipeline, under a minimum two ft. of soil serving as freeze protection. The pipes will have a continuous downwards slope towards the LERF and ETF, and will be designed to maintain structural integrity.

Intraplant Piping

Within plants, the pipelines associated with the tank system will be single-walled. Secondary containment will be provided for all piping within the plants by double-walled pipe or stainless steel lined process cells, process rooms, or caves. If needed, other containment methods such as a bulge or concrete ducts with stainless steel liner will be provided at appropriate locations. The bulge or concrete ducts will be provided with a low point which will drain to process cells, process rooms, or caves. The leak detection equipment located within the process cells, process rooms, and caves will warn of a piping leak through alarms.

Piping between plants and the three outdoor tanks at the LAW pretreatment plant will be below grade and below the freeze line, similar to the HLW transfer line. Piping will be double-walled stainless steel.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided will include the following:

- All piping system design, including materials of construction, and piping structural design standards and criteria
- Piping corrosion protection method and assessment (for underground piping only)
- Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.2.3. Description of Foundations

Tank systems containing mixed waste that will be located indoors in process cells or caves, which will be integral parts of the pretreatment plant, the LAW pretreatment plant, the LAW vitrification plant and the HLW vitrification plant with the exception of three outdoor tanks. Therefore, the design requirements of the tank systems will be met by the structural integrity of the plants. The SADAR, identified in Appendix 4A, provides the outlines on the seismic design requirements and preliminary seismic analysis results for the RPP-WTP. The outdoor tanks will be located outside of the LAW pretreatment plant on a protectively-coated concrete pad and concrete berm. The concrete pad for these tanks will be sufficient to support the tanks.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided will include the structural analyses of pretreatment, LAW pretreatment, LAW and HLW vitrification plants and the pad for the three outdoor LAW pretreatment plant tanks. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.3. Integrity Assessments [D-2a(2)]

This section discusses assessment of the structural design of the tanks and foundation.

A written assessment of the adequacy of the design, and the structural integrity and suitability of all tank systems, including ancillary equipment, will be prepared. The assessment will be reviewed and certified by an independent qualified professional engineer, in accordance with WAC 173-303-810(13)(a), "General Permit Conditions", to attest that the tank systems are adequately designed for managing mixed waste. The assessment will include an evaluation of the foundation, structural support, seams, connections, pressure controls, compatibility of the waste with the materials of construction, and corrosion controls for each mixed waste tank system.

The tank systems will be located indoors, except the outdoor LAW pretreatment plant tanks, so corrosion from environmental factors such as soil, groundwater and precipitation is not a factor. The three outdoor tanks will be located on a concrete pad with concrete secondary containment. The tanks will not be in contact with soil, therefore a review conducted by an expert corrosion specialist is not required.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes a written tank system design assessment report reviewed and certified by an independent, qualified, registered professional engineer, attesting that the tank system has sufficient structural integrity and is acceptable for the treating and storing of mixed waste in accordance with WAC173-303-810(13)(a). This information may be provided on a tank system by tank system basis. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.4. Additional Requirements for Existing Tanks [D-2a(3)]

Tanks and vessels to be permitted in the RPP-WTP will be newly constructed; pre-existing tanks will not be used. Therefore, the requirements of this section do not apply.

4.3.2.5. Additional Requirements for New Tanks [D-2a(4)]

A detailed plan for installing and inspecting tanks is required by WAC173-303-640(3)(c),(e),(f), and (g). Tanks will be rigorously inspected by an independent registered professional engineer before, during, and after installation. Post-installation inspections will include a cold run test (using nonradioactive material feed) and verification of compliance with design dimensions, including wall thickness and corrosion protection. Inspection activities will include testing tanks for tightness, verifying protection of ancillary equipment against physical damage and stress, and evaluating evidence of corrosion. The inspections will document weld breaks, punctures, coating scrapes, cracks, corrosion, and other structural defects. Installation inspections will conform to consensus-recognized standards. Inspection findings and corrective actions will be documented in a post-inspection report to be attached to the installation and inspection plan.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes a tank systems installation and inspection plan. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.5.1. Additional Requirements for New On-Ground or Underground Tanks [D-2a(5)]

The majority of the tanks and vessels to be constructed in the RPP-WTP will be located within the pretreatment plant, the LAW pretreatment plant, the LAW vitrification plant, and the HLW vitrification plant. Therefore, the requirements of this section do not apply to the indoor tanks.

The three outdoor tanks located at the LAW pretreatment plant will be located within a bermed and lined secondary containment system and will not be in direct contact with soil. The design of the outdoor tanks' concrete pad will address backfill, soil saturation, seismic forces and freeze thaw effects. The ancillary piping for the unit will be in contact with the soil, and the effects of corrosion on the piping will be addressed in the final design.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes concrete pad design and construction for the outdoor tanks and associated piping system. Refer to Appendix 4A for details of the proposed information.

4.3.2.6. Secondary Containment and Release Detection for Tank Systems [D-2b]

This section provides information about the secondary containment for tank systems that will contain mixed waste in the RPP-WTP. Descriptions of equipment and procedures used for detecting and managing releases or spills from tank systems are also provided.

4.3.2.6.1. Secondary Containment System Requirements [D-2b(1)]

Most of the tanks systems containing mixed waste will be located within the plants, although three tanks will be located outside the LAW pretreatment plant. Tank systems containing mixed waste that are located within the plants will be arranged within various stainless steel-lined process cells, process rooms,

or caves that will act as secondary containment. The outside tanks will be located on a concrete pad within concrete berms that will act as secondary containment.

The secondary containment systems will be designed, installed, and operated to prevent migration of waste or accumulated liquid to soil, groundwater or surface water. The piping associated with the tank systems will be located in the process cells, process rooms, caves, berms, or bulges. Secondary containment for piping systems will be incorporated into the design.

The following subsections provide detailed descriptions of typical secondary containment systems that will be used at the RPP-WTP.

Process Cells

Process cells will be located within process plants. Process cells will typically be constructed of concrete walls to protect plant operators and the environment from radiological exposure and to prevent migration of waste or accumulated liquid to soil, groundwater, or surface water. The process cells will house equipment and pipe-work designed to require little or no maintenance for the duration of the RPP-WTP. Process cell access will not be allowed during normal radioactive operations. A typical process cell is shown in Figure 4-46.

The process cell floors and portions of walls will be lined with stainless steel. The floor will be sloped to a collection sump to allow for collection and removal of accumulated liquid within the sump.

Process Rooms

Process rooms will be located in the LAW vitrification plant and will be very similar to process caves. Access to process rooms will not be allowed during normal radioactive operations. However, access will be allowed for certain areas within RPP-WTP for non-routine operations such as equipment replacement or maintenance. All process rooms will have a stainless steel liner on the floor and portions of the walls, except the LAW melter gallery area. This area will have a protective coating on the concrete floor and walls. All systems within process rooms that manage mixed waste will have secondary containment (for example the LSM and piping).

Caves

Caves will be located within process plants. Caves will typically be constructed with concrete walls thick enough to protect personnel from radiological exposure. Caves will house mechanical handling equipment designed for remote operation, although limited hands-on maintenance may be permitted. They will generally have sealed lead glass viewing windows and CCTV to allow observation of the cave operations and for overseeing remote maintenance. A typical cave layout containing remote operation is provided in Figure 4-47.

The cave floors and portions of the walls will be lined with stainless steel. The floor of the cave will be sloped to a collection sump to allow for collection and removal of accumulated liquid within the sump.

Berms

Concrete berms will be used at the three outside LAW pretreatment tanks. The berms will be of sufficient structural strength and height to contain the 100 percent of the volume of the largest tank plus the amount of precipitation that results from the 24-hour, 25-year storm event. A protective coating will be applied to the concrete pad and a portion of the berms to prevent any contaminant penetration into the concrete. The

containment system will be designed to allow for the discharge of storm water after visual or other testing. Additional information will be provided when the design is complete.

Sump and Secondary Containment Drain System

The sump and secondary containment drain systems in the four process plants will vary slightly. Following is a description of these systems by plant. All systems will monitor and collect liquids managed in the system.

Pretreatment Plant Sumps

The sumps throughout the pretreatment plant have a standardized design. Figure 4- 48 is an illustration of typical pretreatment plant sump. Table 4-10 identifies the sump locations and associated effluent routes.

All the pretreatment sumps will be provided with a stainless steel liner to act as the secondary containment. The sumps within the process cell will provide a low point for each secondary containment. Wash rings will be provided within the cells for equipment, vessel and cell washing and decontamination operations. The cell sumps will serve the following functions:

- Low point containment
- Removal of material by means of sump emptying ejectors
- Sampling of material by means of sump sampling ejectors

All process sumps will be provided with a wash ring, a plant wash addition line, a sump emptying ejector, a sampling ejector, and liquor level detection and alarm instrumentation. A small quantity of clean water will be maintained in the sump, to allow constant liquid level monitoring and to provide an air seal between the vessel vent system and the cell ventilation.

Sump emptying ejectors will be located in each of the in-cell sumps. These ejectors will move the content of the sump into the plant wash collection system, which will drain to the pretreatment plant wash vessel located at the –50 ft. level of the facility.

LAW Pretreatment Plant Sumps

A typical LAW treatment plant sump is shown in figure 4-48. The sumps within process cells will provide a low point for each process cell. Wash rings are provided within the cells for equipment, vessel and cell washing and decontamination operations. The cell sumps will serve the following functions:

- Low point collection and containment
- Removal of material by means of sump emptying ejectors
- Sampling of material by means of sump sampling ejectors

All process sumps are provided with a wash ring, a plant wash addition line, a sump emptying ejector, a sump sampling ejector and sump liquor level detection and alarm instrumentation. A small quantity of clean water will be maintained in the sump to provide constant liquid level monitoring and to provide a seal between the vessel vent system and the cell ventilation. Table 4-11 identifies the sumps currently planned at the LAW pretreatment plant.

LAW Vitrification Plant Sump and Secondary Containment Drain Systems

The design of the LAW vitrification plant sump and drain system is maturing. This section describes the preliminary sump and secondary containment drain system design that will be used within the LAW vitrification plant. Table 4-12 identifies the sumps currently planned for the LAW vitrification plant.

Most of the process cells and rooms will have secondary containment drains with remotely-removable plugs. Figure 4-49 depicts a typical secondary containment drain system. This type of liquid collection system will be located in a low spot in the cell formed by the sloping floor. Liquid detection instrumentation will be present on the top of a remotely removable plug. After the plug is removed, any liquid collected will gravity-drain to a collection vessel with a tank level indicator. The liquid managed could be waste released from a tank or piping, or water used to wash the exterior of tanks or the walls of the room. Liquid managed in the sump system could also be infrequently generated from the wash-down of cell walls or tank exteriors.

Mechanical caves that deal only with mechanical handling operations and contain dry material will be provided with dry cave sumps similar to those in the HLW vitrification plant (see HLW vitrification sump and secondary containment drain systems). A typical dry mechanical sump is shown in Figure 4-50. Process cells located in the basement of the LAW vitrification plant will use sump systems similar to those in the HLW vitrification plant.

HLW Vitrification Sump and Secondary Containment Drain Systems

There are three groups of sumps in the HLW vitrification plant:

- Process sumps
- Wash system sumps
- Dry mechanical cave sumps.

Table 4-13 identifies the sumps currently planned at the HLW vitrification plant. Descriptions of the sumps are provided below.

Process Sumps

Process sumps fall into two categories: cell sumps and wet mechanical cave sumps. These sumps will serve as the low point collection system for the stainless steel containment in a cell or mechanical cave where tanks are present. The sump and stainless steel lining will provide secondary containment for the tanks and piping containing mixed waste. All process sumps will be provided with a level detection and alarm device and a washout and emptying pump.

- **Cell sumps:** These are generally associated with a high radiation cell environment containing treatment tanks and piping. They are provided with maintenance-free fluidic emptying systems, such as ejectors or RFDs. These are wet sumps in which water will always be present to provide liquid level detection and trigger an alarm, if necessary. A diagrammatic representation of a cell sump is shown in Figure 4-51.

- **Wet mechanical cave sumps:** Sumps that manage treatment tanks in close proximity to mechanical equipment have the same requirements as cell sumps. However, because the cave has mechanical handling systems, the sump may be fitted with a mechanical pump or fluidic device for emptying purposes. A diagram representing of this type of sump is shown in Figure 4-51.

It should be noted that a number of process pipe transfer duct drains will provide drainage back to a suitable cell or wet mechanical sump. Waste pipes will be routed to various destinations within the plant. Some of these routes will require the use of concrete ducts, to provide radiation shielding and secondary containment coverage for the piping. The transfer ducts will be provided with stainless steel lining that drains to a low point within the duct, which will be drained to a suitable cell or wet mechanical sump to provide leak detection and sampling access. The transfer ducts will be provided with wash systems for area cleanup in the event of a pipe leak.

Wash System Sumps

These sumps will be located in decontamination areas of mechanical handling caves, and will serve as a collection point for the liquids from equipment wash-down prior to maintenance. The wash sumps can be gravity drained or pumped to the plant wash collection vessel, and gravity-drained or pumped to a nearby pumped wash vessel. All wash system sumps and the plant wash collection vessel will be provided with a level detection and alarm system, to shut off wash water supply valves if necessary. They will also be provided with a trash screen to prevent debris entering the wash system piping. Gravity drain wash sumps will have a yearly leak test for liner and drain line integrity requirements. A diagrammatic representation of this sump type is shown in Figure 4-52.

Dry Mechanical Cave Sumps

Mechanical caves that deal only with mechanical handling operations and contain dry material will be provided with dry cave sumps. The sump will provide a low point collection for the infrequent washing of machinery or the cave floor, for general cleanliness or decontamination prior to maintenance or deactivation. In some caves, these sumps will also collect leakage from any effluent system transfer pipes associated with or passing through the cave. Dry sumps are generally fitted only with a level detection device with alarm. Their contents are removed using mechanical or fluidic pumps. A diagrammatic representation of this sump type is shown in Figure 4-50.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes a description of procedures for the management of releases from tanks to sumps. Refer to Appendix 4A for details of the proposed information completion schedule.

Design Requirements

The process cells, process rooms, or caves with mixed waste vessel or tank systems will be partially lined with stainless steel, which will cover the floor and extend up the sides of the process cell or cave to a height that can contain 100 percent spillage from the largest tank within the process cell or cave. The 100 percent spillage will not include fire suppression material, as the tanks will not manage ignitable waste. The concrete surfaces of the ceiling and the wall above the liner will be covered with a coating that is compatible with the waste feed to provide a splash shield zone. A sealant, compatible with the liner and the waste feed and wall coating, will be used to seal the liner-to-wall interface. The sizes of the process cells, process rooms, and caves are shown in the general arrangement drawings identified in Appendix 4A. Table 4-14 presents the projected minimum liner height at the four process plants. Calculations for the liner size necessary in each cell and cave are available upon request.

A concrete berm with protective coating will be used for the LAW pretreatment plant outdoor tanks. The protective coating will be sized to contain 100 percent spillage from the largest tank within the berm, plus the precipitation from a 25-year 24-hour rainfall event, as required under WAC 173-303-640(4)(e)(i)(B). The size of the berm is shown in the general arrangement drawings identified in Appendix 4A.

Table 4-14 presents the projected minimum liner height. Calculations for the liner size necessary in the berms are available upon request.

The RPP-WTP uses consensus-recognized standards to ensure that the process cells, process rooms, caves, or berms provide secondary containment with sufficient strength, thickness, and compatibility with waste. The design includes an engineered structural base to protect the cells, caves, berms and tank systems against failure resulting both from excess force applied during catastrophic events or settlement, and from the stress of daily operation. In the event of a spill or release, the structural and foundation design for tank and process cells, process rooms, caves and berms will prevent released mixed waste from reaching the environment, and will safely contain the waste until it can be transferred to an appropriate collection tank.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided is as follows:

- The final design of the secondary containment systems
- Compatibility of the waste with the secondary containment system

Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.6.2. Management of Release or Spill to Sump and Secondary Containment Drain Systems [D-2b(1)]

If a wet-type sump is used, a small amount of clean water will be maintained in the sump during normal operating conditions. During normal operation, the water level will be maintained between the low and high operational controls. The operation control band limits will be set as close to each other as possible, and the alarm will be set above the high operational control to detect unusual level rises. The sump level will be constantly monitored. Typically, a moderate leak will generate a larger liquid volume than the amount of liquid that might be lost due to evaporation.

Abnormal rising of the liquid level in the sump will be investigated to determine its cause. In all cases, the cause for material in the sump will be determined. Mixed waste released from the primary system and collected in the sumps will be removed within 24 hours, or in as timely a manner as possible. If the released material cannot be removed within 24 hours, Ecology will be notified. After the sump content has been removed, the sump surfaces will be decontaminated using a wash-down system. Based on best management practices, a water flushing volume of approximately six sump volumes will be used to remove residual process water. An engineering calculation (CALC-W375PT-PR00209) has been performed and demonstrates that a six-wash volume will be sufficient to achieve target removal efficiency.

If a dry-type sump is used, it will be equipped with a moisture probe to detect leakage. If liquid is detected in the dry sump, similar procedures as described above for wet-type sumps will be used to remove the content and decontaminate the sump surfaces.

The secondary containment drain design is under development and will be provided in the near future. However, if liquid is detected in the secondary containment drain, similar procedures to those described above for wet-type sump will be used to remove drain contents and decontaminate drain surfaces.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes the following:

- Descriptions of procedures for the management of release to sump and secondary containment drains
- Descriptions of sump and secondary containment drain decontamination procedures

Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.6.3. Additional Requirements for Secondary Containment [D-2b(2)]

These requirements pertain to tanks in vault systems and double-walled tanks, which will not be used at the RPP-WTP. These requirements are not applicable at the RPP-WTP.

Ancillary equipment such as piping is addressed within section 4.3.2. Other types of ancillary equipment such as pumps, seal pots, and RFDs, are either located in stainless-steel lined process rooms/cells or caves or are designed to provide their own secondary containment. For example, pumps and valves operating in a cell with no stainless steel lining will be located in a "bulge". Bulges are boxes, tubes, or other shapes that provide steel secondary containment for ancillary equipment that manages mixed waste. Inspection of ancillary equipment is addressed in Chapter 6.

4.3.2.7. Variances from Secondary Containment Requirements [D-2c]

No variances from secondary containment requirements are sought for the RPP-WTP tank systems. Tank systems will be provided with secondary containment in the form of partially steel-lined or protectively coated process cells or rooms, caves and berms, as described in the previous sections.

4.3.2.8. Tank Management Practices [D-2d]

This section presents the administrative procedures used to prevent spills, overflows, leaks and ruptures in the tank systems. The engineering design will minimize the likelihood of tank, ancillary equipment or containment system overflows, and over-pressurization, ruptures, leaks, corrosion, or other failures. For example, the evaporator process operations will be performed under vacuum to minimize high-temperature corrosion from acid that results from chlorides in the feed.

The primary design concept of overflow control is to prevent an overflow from occurring. In the RPP-WTP, overflows will be prevented by the following means:

- Inventory control
- Primary level monitoring
- High-level instrument control system alarms
- Automatic interlock or trip action on pre-selected tanks

In general, overflows will be prevented by inventory control in conjunction with level monitoring. The fluid levels in a tank will be maintained within low and high-level ranges. Appropriate alarm settings will be used to note any deviations from the designed settings. The automatic trip action is designed to shut down feed to the tank when the high level settings are exceeded. These automatic interlock and trip actions will be provided for tanks with the potential for high operational and environmental impact in case of an accident or release.

All non-pressure vessels (nominally operating at atmospheric pressure) will have a suitable gravity overflow system or engineered overflow routing, unless an overflow can be shown not to be possible.

Typically, a tank will have at least one other tank into which it may overflow, if needed. Descriptions of the overflow routing details are identified in Appendix 4A.

Appropriate overflow controls are being designed to minimize the possibility of spills, leaks, and overflows from tank systems. Some of the measures include selecting appropriate materials of construction, level-sensing devices, and level alarms. The PFDs identified in Appendix 4A depict the locations of overflow controls for each tank system.

Most of the RPP-WTP tank systems will be designed to incorporate minimal or zero maintenance requirements, will contain no moving parts, and will be based on a design life of approximately 40 years. Zero maintenance design extends to processes and areas where operations are required to continue without maintenance. This design emphasis minimizes the likelihood of spills and overflows in the tank systems, resulting from vessel and pipework corrosion. Inspections to be performed on the various tank systems are described in Chapter 6.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes the final tank operating parameters. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.2.9. Labels or Signs [D-2e]

Tanks holding mixed waste will be labeled with stainless steel engraved nameplates. They will inform employees and emergency personnel of the types of waste present, warn of the identified risks, and provide other pertinent information.

4.3.2.10. Air Emissions [D-2f] and [D-8]

This section describes air emissions from vessel ventilation systems and RFD exhausts. Organic emissions from vents associated with evaporator or distillation units are also discussed.

4.3.2.10.1. Tank System Emissions [D-2f]

Most of the tanks will be connected to a vessel ventilation system to collect vapors. Vessel vents will be located on major tanks, breakpots, and other small vessels. Exhaust from RFDs and PJMs will also be collected.

4.3.2.10.2. Process Vents [D-8a]

The air emission regulations, specified under 40 CFR Part 264 Subpart AA, apply to process vents associated with distillation, fractionation, thin-film evaporation, and air or steam stripping operations that manage mixed waste with total organic carbon (TOC) concentrations of at least 10 parts per million by weight. This regulation does not apply to the RPP-WTP. A discussion on the RPP-WTP approach to this regulation is identified in Appendix 4A.

4.3.2.10.3. Equipment Leaks [D-8b]

Regulations provided in 40 CFR Part 264 Subpart BB contain the "Air Emission Standards for Equipment Leaks". These air emission standards do not apply to the RPP-WTP because waste feed entering the RPP-WTP contains less than 10 percent TOC by weight and is excluded under 40 CFR 1050(b).

4.3.2.10.4. Tanks and Containers [D-8c]

The regulations specified under 40 CFR Part 264 Subpart CC do not apply to the RPP-WTP mixed waste tank systems and containers. These tanks and containers qualify as waste management units that are "used solely for the management of radioactive dangerous waste in accordance with all applicable regulations under the authority of the Atomic Energy Act (1954) and the Nuclear Waste Policy Act (1982) and are excluded under 40 CFR 264.1080(b)(6)". Containers bearing nonradioactive, dangerous waste, such as maintenance and laboratory waste, that is not excluded under 40 CFR 264.1080 (b)(2) or 40 CFR 264.1080(b)(8), will comply with the tank and container standards specified under 40 CFR Part 264 Subpart CC.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes the emission requirements for mixed waste containers. The proposed information completion schedule is identified in Appendix 4A.

4.3.2.11. Management of Ignitable, Reactive and Incompatible Waste in Tanks [D-2g] and [D-2h]

Mixed waste from the DST system unit will initially be characterized as both ignitable (D001) and reactive (D003). The D001 and D003 waste numbers will be removed using process knowledge and analysis while stored in the receipt tanks. The vessels will be located in a manner that meets the National Fire Protection Association (NFPA) buffer zone requirements for vessels, as contained in Tables 2-1 through 2-6 of the *NFPA-30 Flammable and Combustible Liquids Code* (NFPA 1981). The vessels will be designed to store the waste in such a way that it will be protected from any material or conditions that could cause the contents to ignite or react. Vessel contents will be constantly mixed and will be actively vented to process stacks, which will be equipped with vapor collection and treatment systems that will manage any emissions. Further information on waste numbers is contained in Appendix 3A.

Ignitable or reactive waste may be generated from laboratory or maintenance activities. This waste will be accumulated and managed in compliance with regulatory requirements, in containers as described in section 4.3.1. Potentially incompatible waste generated from laboratory or maintenance activities will not be stored in the tank systems.

A potential for incompatibility may exist, for example when nitric acid is used to elute waste components from ion-exchange column resins that were previously regenerated with sodium hydroxide. To minimize any reaction, water flushes will be performed between batches. Additional details on tank operating procedures for managing potentially incompatible waste streams are identified in Appendix 4A.

Process reagents that could react with waste in the tank systems will be stored in areas that are separated by physical barriers from process tanks. Potentially incompatible wastes generated from laboratory or maintenance activities will not be stored in proximity to each other in the tank systems.

4.3.2.12. Worked Tank Example

There will be many tanks and tank systems operating at the RPP-WTP. To facilitate understanding of tank functions, design and operation, a worked tank example titled *Worked Example for Vessel V13024A* is identified in Appendix 4A. The information in the example consists of the following:

New Tank Structural Assessment

- Tank system description – tank function, and method to be used to manage the waste
- Tank structure – design codes and standards, structural calculations, seismic risks and corrosion protection
- Design requirements – tank and ancillary equipment specifications, including:
  - materials of construction
  - lining or coating materials, dimensions, capacity, shell thickness, corrosion protection, connections, pressure controls, foundation, structural support and seams
  - drawings and engineering calculations
  - industrial design standards
- Waste compatibility – material selection, waste types managed, structural strength, corrosion protection

Controls and ancillary equipment

- Tank system controls to prevent rupture and overflows – monitoring instruments, safety interlocks, spill overflow pathways, and pressure control system
- Ancillary equipment – piping, fittings, valves and pumps

Secondary Containment

- Liner dimensions
- Materials of construction
- Seismic standards
- Release detection – type of instrument

Ventilation

- Materials of construction
- Codes and standards
- Compatibility with waste
- Flow and calculations
- Structural considerations

4.3.3. Miscellaneous Units [WAC 173-303-680 and WAC 173-303-806(4)(i)]

This section describes LAW and HLW melter operations conducted at the RPP-WTP. The thermal treatment miscellaneous units will be melters and will be used to immobilize dangerous and radioactive waste constituents by vitrification. There will be three miscellaneous units in the LAW vitrification plant (LAW melters 1, 2, and 3) and one miscellaneous unit in the HLW vitrification plant (HLW melter). The EDDs of the LAW and HLW melters are identified in Appendix 4A. Drawings of the LAW and the HLW melter units are also identified in Appendix 4A.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes the final LAW and HLW melters design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.3.1. Melter Capacity and Production

For the LAW melters, throughput is defined on the basis of quantity of glass waste produced. In turn, the quantity of glass waste produced depends on the degree to which the LAW feed can be incorporated into the glass waste matrix. The maximum design throughput of the LAW melter systems will be approximately 15 metric tons per day of glass waste for each melter and approximately 50 metric tons per day as maximum possible throughput for the LAW vitrification plant. The maximum operating production rate of the HLW melter is approximately three metric tons per day.

4.3.3.2. Description of Melter Units [WAC 173-303-806(4)(i)(i)]

The LAW melter systems are located in a melter gallery and the HLW melter is housed within a melter cave as shown in the general layout drawings, which are identified in Appendix 4A. The following subsections provide detailed descriptions of the melter units.

Low-Activity Waste Melter Unit

The current design of the LAW melter is a rectangular tank, lined with refractory material, with an outer steel casing. An additional outer steel casing with access panels will be provided to enclose the LAW melter. This outer steel casing is designed to provide local shielding and containment. Each melter has a nominal design capacity of approximately 10 to 15 metric tons of glass waste per day. Each will have a molten glass surface area of approximately 108 ft^2. Each of the three melters has external dimensions of approximately 26 × 19 × 16 ft high, and weighs approximately 450 metric tons empty, and 475 metric tons with glass. The operating temperature of the melter is between 950 °C and 1,250 °C.

The locally shielded LAW melter (referred to as LSM in section 4.2.4) will be operated and maintained in a personnel access area. The melter will be maintained at a lower pressure than the surrounding room to prevent escape of contaminants. Consumable melter parts will be replaced through access panels. The melters will be transported in and out of the gallery on a rail system. A transporter will move the melters to and from the LAW vitrification plant.

The melter refractory package is designed to serve as a mechanical, thermal and electrical barrier between the molten glass residing in the melter and the melter shell.

The refractory package is housed in a steel shell and provides ultimate containment for the molten glass. Active cooling on the exterior of the melter is provided by water jackets. The water jackets will be in the intermediate loop of a two-loop system that will transfer heat from the LAW melter through heat exchangers to cooling towers. The intermediate loop containing the water jacket will be a closed system that isolates the water circulating through the water jacket from the water in the cooling water loop circulating to the cooling tower. Any radioactive material leaking into the intermediate loop cooling water will be prevented from becoming an inadvertent discharge via the cooling tower. The refractory package will provide adequate containment if there is a temporary loss of cooling. Penetrations in the melter system are sealed using appropriate gaskets and flanges. This system is designed for plenum temperatures of up to 1,100 °C. The LAW melter lid is composed of steel and refractory material layers.

Each LAW melter will use two independent discharge chambers. An air lift pumps molten glass from the bottom of the melter pool, through a riser, into a discharge chamber, and poured into an ILAW container.

The ILAW is then allowed to cool, forming a highly durable borosilicate glass waste form within the container.

Waste melters will initially be managed within the LAW LSM gallery containment building unit. Waste melters will be removed from the melter gallery and transported using a bogie transport and rail system. If necessary, the melter exterior surfaces will be decontaminated. The waste melters will be stored at the melter storage area no. 1 or 2 prior to offsite disposal.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes the LAW melter design for construction. Refer to Appendix 4A for details of the proposed information completion schedule.

High-Level Waste Melter Unit

The current design of the HLW melter is a rectangular tank lined with refractory material, with an outer steel casing. It has four compartments: glass tank, two discharge chambers, and a plenum just above the glass tank. The tank is lined with refractory material designed to withstand corrosion by molten glass.

The HLW melter system consists of one melter with the capability for a second melter. The HLW melter system has a nominal design capacity of 1.5 metric tons of glass waste per day and a maximum capacity of three metric tons per day. The operating temperature of the melter is between 950 °C and 1,250 °C. The HLW melter has a molten glass surface area of approximately 40 ft^2. The melter has external dimensions of approximately 12 × 15 × 12 ft. The glass contained in a full HLW melter has a volume of approximately 145 ft^3 and weighs approximately 9.1 metric ton. The entire melter, including the supporting structure and transport mechanism, weighs approximately 90 metric tons empty, and approximately 99 metric tons full.

The HLW melter has been designed to be remotely operated and maintained. Remote maintenance will be performed by power manipulator, overhead crane, and auxiliary hoist, or by through-wall MSMs. The melter will be positioned within the HLW vitrification plant for ease of access and viewing of both discharge chambers during operations, and for viewing access to the melter lid to facilitate removal and replacement of subcomponents, if needed. A rail and bogie transport system will facilitate remote removal and replacement of the entire melter structure.

The HLW melter will use a refractory package similar to the LAW melter to contain the molten glass. The refractory package is designed to serve as a mechanical, thermal and electrical barrier between the molten glass inside the melter and the melter shell.

The HLW melter will also use a steel outer shell, which, with the refractory package, will contain the molten glass and melter offgas. Active cooling on the exterior of the melter will be provided by a water jacket, which will be in a two-loop system that will transfer heat from the HLW melter through heat exchangers to cooling towers. The loop containing the water jacket will be a closed system that isolates the water circulating through the water jacket from the water in the cooling water loop circulating to the cooling tower. Any radioactive material leaking into the intermediate loop cooling water will be prevented from becoming an inadvertent discharge through the cooling tower. The refractory package will provide adequate containment should there be a loss of cooling. The HLW melter lid will be constructed of a steel outer shell and insulated from the melter plenum by refractory material.

The HLW melter will use two independent discharge chambers. Discharge will be achieved by transferring the molten glass from the bottom of the melter pool, through a riser, from which it will be

poured into a stainless steel IHLW container. Glass waste transfer will be accomplished through air lifting. The IHLW will then be allowed to cool, forming a highly durable borosilicate glass waste form.

Waste melters will be removed from the melter cave and placed in an overpack. The spent melter will be treated as newly generated waste, and will initially be managed within the HLW melter containment building. If necessary, the overpack will be decontaminated using a dry process. Waste melters will be stored in melter storage area no. 1 or 2.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes the HLW melter design for construction. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.3.3. Melter Operations

The melters will be equipped with an automatic waste feed cut-off function. This design approach is consistent with the WAC 173-303-680 regulatory requirements. Based on previous operating experience with similar melters, two scenarios that would lead to automatic waste feed cutoff have been identified:

- Excessively high pressure in the melter
- Excessively high level of waste material in the melter

The melter system is designed to minimize the need for an automatic waste feed cut-off function. Sufficient controls, such as level detection and alarm systems in conjunction with operating methods, will be in place to minimize the occurrence of these conditions. The best melter operating conditions for waste product quality and secondary waste generation are achieved when the melter control parameters are kept steady.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes final design of the automated safety features for the LAW and HLW melters. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.3.4. Offgas Treatment System

The offgas treatment system will remove steam, aerosols, entrained particulates, decomposition products, and volatile contaminants that are generated from the vitrification processes and the vessel ventilation systems. The principle constituents contained in the melter offgas stream are as follows:

- Air in-leakage and purges into the melter
- Water vapor and VOCs evaporated from the melter feed
- Acid gases generated from anion decomposition (i.e., nitrogen oxide and sulfur oxide)
- Aerosols from dried melter feed and melter cold-cap reaction solids

A detailed description of the current offgas treatment trains for the LAW and HLW melters is provided in sections 4.2.4 and 4.2.5, respectively.

4.3.3.5. Physical and Chemical Characteristics of Waste [WAC 173-303-680(2)(a)(i)]

A description of the waste characteristics of the LAW and HLW feeds is presented in Chapter 3. The immobilized waste generated by the vitrification processes will be in the form of glass that maintains its chemical and physical integrity during long-term storage. The waste analysis plan (appendix to Chapter 3) describes the types and frequency of analysis that will be performed on the glass waste.

4.3.3.6. Treatment Effectiveness Report [WAC 173-303-806(4)(i)(iv)]

A treatment effectiveness report evaluating the performance of the miscellaneous units, and their effectiveness in treating the LAW and HLW, will be provided. Sampling and analyses to be performed on the glass waste are described in the waste analysis plan (appendix to Chapter 3). Air monitoring and analysis requirements are addressed in the RPP-WTP air permits.

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information to be provided includes a treatment effectiveness report. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.3.7. Environmental Performance Standards for Melter Systems [WAC 173-303-680(2)]

An environmental performance demonstration will be conducted to demonstrate the efficiency of the LAW and HLW melter systems and their respective air pollution control systems. Emissions from the LAW and HLW systems will be sampled and analyzed as described in the *Environmental Performance Demonstration Plan* (EPDP) (Appendix 4A). The data developed during the environmental performance demonstration will support the screening level risk assessment (Appendix 4A), which will support the development of environmental performance standards for the LAW and HLW melter systems.

The operational activities of the RPP-WTP include methods intended to ensure proper performance of equipment and processes. These methods include sampling of materials, use of direct process controls, development of equipment life specifications and ongoing maintenance.

4.3.3.7.1. Protection of Groundwater, Subsurface Environment, Surface Water, Wetlands and Soil Surface [WAC 173-303-680(2)(a) and (b)]

The LAW melters will be located in the LAW melter gallery within the LAW vitrification plant. The HLW melters will be located in the HLW melter cave within the HLW vitrification plant. Both plants are designed to comply with standards that ensure protection of the surface and subsurface environments. The vitrification plants will be completely enclosed and are designed to have sufficient structural strength and corrosion protection to prevent collapse or other structural failure. In addition, the melter systems, melter feed systems, and all related piping will be provided with secondary containment, to minimize the potential for release. The LAW melter gallery and the HLW melter cave will be permitted as containment buildings and are described in section 4.3.4.

Floors within the vitrification plants will be protected in a manner consistent with the intended usage of the space. The process room floor and walls of the LAW melter gallery will be protectively coated. The floor and portions of the walls of HLW melter cave will be lined with stainless steel. Nonradioactive materials usage areas requiring heavy equipment will have concrete floors with hardener and sealer finishes.

The *Hanford Facility Dangerous Waste Permit Application General Information Portion*, Section 5.4 (DOE-RL 1998) provides climatological data, topography, hydrogeological and geological characteristics, groundwater flow quantity and direction, groundwater quality data, and surface water quantity and quality data for the area around the RPP-WTP.

4.3.3.7.2. Protection of the Atmosphere [WAC 173-303-680(2)(c)]

A risk assessment will be performed to evaluate the impacts of the RPP-WTP emissions on human and ecological receptors (see section 4.3.3.8). Actual offgas emissions will be measured during an environmental performance demonstration that will be performed as part of the RPP-WTP commissioning activities. The data will be used during a screening level risk assessment that will be performed to determine ecological and human health risk. The emissions data, and the results of the screening level risk assessment, will be used to establish operating conditions for the melters that do not endanger human health and the environment. Additional details are provided in the screening level risk assessment (Appendix 4A) and EPDP (Appendix 4A).

4.3.3.8. Approach to Risk Assessment [WAC 173-303-680(2) (c)(i) through (vii)]

A screening level risk assessment will be conducted to evaluate the environmental impacts posed by the thermal treatment of miscellaneous units. It will provide information about the potential pathways for exposure of human and ecological receptors to dangerous waste constituents. This risk assessment will present the methods, assumptions and parameters that will be used to estimate the nature and magnitude of potential impacts from operation of the RPP-WTP, and will identify the guidance documents used in performing the risk assessment.

Treated air emissions through the stack will be the only planned releases from the RPP-WTP released directly into the environment. Other waste streams will be transferred to a permitted facility and will not be released directly into the environment. The screening level risk assessment will focus primarily on air emissions.

Major components of the risk assessment process for evaluating airborne emissions will be as follows:

- *Work Plan for* Screening *Level Risk Assessment for the RPP-WTP (*Appendix 4A)
- Preliminary risk assessment
- Final risk assessment

The overall approach will be to identify potential risks associated with two exposure scenarios: \

- Worst-case exposure scenario
- Plausible exposure scenario

The worst-case exposure scenario will be based on worst-case assumptions regarding the location of receptors, exposure pathways, and activity pattern. The plausible exposure scenario will be based on more realistic assumptions regarding the location of receptors. It will reflect current uses of the surrounding land and habitats, and reasonable assumptions about future uses of the land.

During the environmental performance demonstration, emission samples will be collected and analyzed, and the data will be used to evaluate risk to human and wildlife receptors. Operating conditions will be established for the RPP-WTP, which limit risks to human health and the environment to acceptable levels. See the EPDP (Appendix 4A) for additional details.

4.3.4. Containment Buildings

This section describes how these units are designed and operated, in accordance with the requirements of WAC 173-303-695, which incorporates 40 CFR Part 264 Subpart DD "Containment Buildings", by

reference. Regulatory citations in this section list the applicable section of the CFR to make it easier for readers to find the requirement.

There will be ten containment buildings at the RPP-WTP: two in the pretreatment plant, four in the LAW vitrification plant, and four in the HLW vitrification plant. The regulated units are:

- Pretreatment C3 workshop containment building
- Pretreatment maintenance containment building
- LAW LSM gallery containment building
- ILAW container-finishing containment building
- ILAW container fixative containment building
- LAW vitrification plant C3 workshop containment building
- HLW melter containment building
- IHLW container weld containment building
- IHLW container decontamination building
- HLW vitrification plant C3 Workshop containment building

Table 4-15 summarizes the units and their locations within the RPP-WTP.

4.3.4.1. Pretreatment C3 Workshop Containment Building

The first containment building in the pretreatment plant will be located in the southwestern portion of the pretreatment plant at the 0 ft elevation, as shown on Figure 4-53.

The pretreatment C3 workshop containment building will be used for decontamination, size reduction and packaging of spent equipment, and will include hatches to import or export spent equipment. An overhead crane will facilitate movement of equipment and removal or placement of spent equipment in the waste containers. Detailed descriptions of the unit's activities are provided in section 4.2.2.

4.3.4.1.1. Pretreatment C3 Workshop Containment Building Design

The pretreatment C3 workshop containment building is designed as a completely enclosed area within the pretreatment plant. It is designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the pretreatment plant exterior will prevent water from running into the plant. The approximate dimensions of the unit are 34 × 124 ×17 ft.

Pretreatment C3 Workshop Containment Building Structure

The pretreatment C3 workshop containment building will be a concrete-walled structure fully enclosed within the pretreatment plant. Therefore, structural requirements for the containment building will be met by the design standards of the pretreatment plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the pretreatment plant are presented in the SADAR identified in Appendix 4A.

Pretreatment C3 Workshop Containment Building Materials

The pretreatment C3 workshop containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel. The roof of the pretreatment plant will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains.

Use of Incompatible Materials in the Pretreatment C3 Workshop Containment Building

A stainless steel liner will be provided for this unit. Stainless steel will be compatible with the equipment wastes that will be managed, which will include failed pumps, ultrafilters, and valves containing a minimal amount of waste constituents. Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the Pretreatment C3 Workshop Containment Building

The pretreatment C3 workshop containment building is designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the plant will be addressed.

Certification of Design for the Pretreatment C3 Workshop Containment Building

Prior to startup of operations, a certification by a qualified independent registered professional engineer that the pretreatment C3 workshop containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because the waste managed in the unit will not contain free liquids or be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes the pretreatment C3 workshop containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.1.2. Operation of the Pretreatment C3 Workshop Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the pretreatment containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the Pretreatment C3 Workshop Containment Building

The stainless steel lining of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner will remain free of corrosion or other deterioration because it is compatible with all materials that will be managed in the containment building. The failed equipment that will be managed in the containment building unit will be compatible with stainless steel. Only decontamination chemicals that are compatible with the liner will be used.

The wastes managed in the unit will not be stacked.

Measures to Prevent Tracking Wastes from the Pretreatment C3 Workshop Containment Building

The pretreatment C3 workshop containment building is designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit. For details of how the unit will keep wastes from being tracked from the unit,

by limiting human access and controlling the movement of equipment into and out of the unit, see section 4.2.2.

Personnel access to the containment building will be limited due to radiological concerns. It will be classified as a C3 contamination area, which allows only limited access by personnel. Wastes leaving the unit will be enclosed within containers. If necessary, these containers will be decontaminated in the unit prior to transportation to a permitted storage area. Equipment leaving the unit will be decontaminated before being released for removal from the cells.

Control of Fugitive Dust from the Pretreatment C3 Workshop Containment Building

The following measures will be used to prevent fugitive dust from escaping the pretreatment C3 workshop containment building:

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit compared to adjacent C2 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD for this unit is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the Pretreatment C3 Workshop Containment Building

The design and operation of the unit makes it very unlikely that any releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. The ventilation system will also use negative air pressure to keep contamination from areas of lesser contamination, and will use two-stage HEPA filtration to reduce the release of particles. The ventilation system is designed with backup HEPA filters to provide redundant controls and to facilitate repairs or replacement.

Inspections will identify conditions that could lead to a release. Any such conditions will be corrected as soon as possible after they are identified. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to the start of operations. These methods will be followed to repair any condition that could lead to a release.

Inspections of the Pretreatment C3 Workshop Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the pretreatment C3 workshop containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit is included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the pretreatment C3 workshop containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.2. Pretreatment Maintenance Containment Building

The pretreatment plant will have a second area that meets the definition of a containment building. The pretreatment maintenance containment building will be located in the southwestern portion at the 20 ft. elevation of the pretreatment plant and will be will be used for equipment maintenance, including decontamination, size reduction and packaging of spent equipment. The unit will include hatches to import or export spent equipment. An overhead crane will facilitate movement of equipment and removal or placement of the spent equipment in the waste containers. A schematic of the location of the unit is shown on Figure 4-54. Detailed descriptions of the unit's activities are provided in section 4.2.2.

4.3.4.2.1. Pretreatment Maintenance Containment Building Design

The pretreatment maintenance containment building is designed as a completely enclosed area within the pretreatment plant. The unit is designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the pretreatment plant exterior will prevent water from running into the plant. The approximate dimensions of the unit will be 23 × 92 × 21 ft high.

Pretreatment Maintenance Containment Building Structure

The pretreatment maintenance containment building will be a concrete-walled structure fully enclosed within the pretreatment plant. Therefore, structural requirements for the containment building will be met by the design standards of the pretreatment plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements of the pretreatment plant are presented in the SADAR as identified in Appendix 4A.

Pretreatment Maintenance Containment Building Materials

The pretreatment maintenance containment building will be constructed of steel-reinforced concrete. The interior floor and portions of the walls of the unit will be lined with stainless steel. The roof of the pretreatment plant will consist of metal roofing, roof insulation, and a vapor barrier. Rainwater run-off will be collected by roof drains and drainage system with overflow roof drains.

Use of Incompatible Materials in the Pretreatment Maintenance Containment Building

A stainless steel liner will be provided for the unit. Stainless steel will be compatible with the equipment wastes that will be managed, which will include failed pumps, ultrafilters, and valves. Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the Pretreatment Maintenance Containment Building

The pretreatment maintenance containment building is designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the plant will be addressed.

Certification of Design for the Pretreatment Maintenance Containment Building

Prior to startup of operations, certification by a qualified independent registered professional engineer that the pretreatment maintenance containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because the waste managed in the unit does not contain free liquid and will not be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes the containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.2.2. Operation of the Pretreatment Maintenance Containment Building

Operational and maintenance controls and practices will be followed to ensure containment of the waste within the pretreatment maintenance containment building as required by 40 CFR 264.1101(c) (1).

Maintenance of the Pretreatment Maintenance Containment Building

The stainless steel lining of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner will remain free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, which will include failed equipment. Only decontamination chemicals that are compatible with the liner will be used.

The wastes managed in the unit will not be stacked. The unit will be completely enclosed and the height of the walls will be 21 ft. high.

Measures to Prevent Tracking Wastes from the Pretreatment Maintenance Containment Building

The pretreatment maintenance containment building is designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. A dust cleanup system will minimize the potential for dust to be tracked from the unit by humans or equipment. For details of how the unit will keep wastes from being tracked from the unit, by limiting human access and controlling the movement of equipment into and out of the unit, see section 4.2.2.

The containment building will be classified as a C3 contamination area, and therefore personnel access will be limited due to radiological concerns. Wastes leaving the unit will be enclosed within containers. If necessary, these containers will be decontaminated in the unit prior to transportation to a permitted storage area. Equipment leaving the unit will be decontaminated before being released for removal from the cell.

Control of Fugitive Dust from the Pretreatment Maintenance Containment Building

The following measures will be used to prevent fugitive dust from escaping the pretreatment maintenance containment building.

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit compared with adjacent C2 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD for this unit is identified in Appendix 4A.

Procedures in the Event of a Release or Potential Release from the Pretreatment Maintenance Containment Building

The design and operation of the unit makes it very unlikely that any releases will occur. The design and operational measures that will be used will minimize the generation of dust and contain it within the unit. The ventilation system will also use negative air pressure to keep contamination from areas of lesser contamination and will use two-stage HEPA filtration to reduce the release of particles.

Inspections will identify conditions that could lead to a release. Any such conditions will be corrected as soon as possible after they are identified. The ventilation system is designed with backup HEPA filters to provide redundant controls and to facilitate repairs or replacement.

In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to the start of operations. These methods will be followed to repair any condition that could lead to a release.

Inspections of the Pretreatment Maintenance Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the pretreatment maintenance containment building. The inspection and monitoring schedule and methods that will be used to detect a release is included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the pretreatment maintenance containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.3. LAW LSM Gallery Containment Building

There will be four containment buildings in the LAW vitrification plant. The first is the LAW LSM gallery containment building, which will be located on the 3 ft level of the LAW vitrification plant, as depicted in Figure 4-55, and will house the three LAW melters. The melters are designed to include a roller or wheel assembly that will be used to move the melters in and out of the containment building. Waste melters will be disconnected from the offgas system, feed lines, electrical lines, and instrumentation. All open ports will be sealed. The sealed exterior of the melter will be decontaminated, if needed, prior to removal from the containment building. Waste melters will be transported out of the unit to melter storage area no. 1 or 2.

4.3.4.3.1. LAW LSM Gallery Containment Building Design

The LAW LSM gallery containment building will be completely enclosed within the LAW vitrification plant. The unit will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification plant exterior will prevent water from running into the plant. The approximate dimensions of the unit will be 151 x 62 x 25 ft high.

The melter feed slurry will be introduced to melter through single walled stainless steel feed lines. The feed lines will be provided with bulges that will function as secondary containment. A low point within the bulge will be incorporated into the design to allow drainage to a sump located in the adjacent process room.

The only other sources of liquids that will be present in the cave are the waterline to the two film cooler pipe washout spray rings, and the melter water jacket and connecting piping. These clean water lines will be instrumented to detect leaks automatically. A rupture of either water line would be an abnormal event and the liquid would be contained within the outer melter shield box and corrective measures would be initiated. Corrective action would start with closure of the supply line and draining of remaining water outside the melter shield box, and could require feed cutoff and melter idling or shut down. The amount of water that could be released into the containment building would be unlikely to exceed a few gallons, which would rapidly evaporate into the ambient air due to the high temperature in the cave under normal operating conditions.

LAW LSM Gallery Containment Building Structure

The LAW LSM gallery containment building will be a concrete-walled structure fully enclosed within the LAW vitrification plant. Therefore, structural requirements for the containment building will be met by the design standards of the LAW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the LAW vitrification plant are presented in the SADAR identified in Appendix 4A. Within the containment building will be partitions between the LSMs.

LAW LSM Gallery Containment Building Materials

The LAW LSM gallery containment building will be constructed of steel-reinforced concrete. The interior floor and the walls of the unit will be covered with a protective coating. The roof of the LAW vitrification plant will consist of metal roofing, roof insulation, and a vapor barrier. Rainwater run-on will be collected by roof drains and a drainage system with overflow drains.

Use of Incompatible Materials for the LAW LSM Gallery Containment Building

A protective coating will be applied to the concrete floor and walls of the unit. The coating will be compatible with the wastes that will be managed in the containment building. The wastes to be managed will include LAW LSM melters and consumables, which may be metallic parts and failed equipment. Very little or no glass waste is expected to be present on the exterior of the LSM, due to the design of the melter. Reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the LAW LSM Gallery Containment Building

The LAW LSM gallery containment building will be designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the LAW vitrification plant will be addressed.

Certification of Design for the LAW LSM Gallery Containment Building

Prior to the start of operations, certification by a qualified registered professional engineer that the LAW LSM gallery containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because waste containing free liquids will not be managed in the containment building and the waste will not be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes a final LAW LSM gallery containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.3.2. Operation of the LAW LSM Gallery Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the waste within the LAW LSM gallery containment building, as required by 40 CFR 264.1101(c)(1). All activities in the building will be remotely-conducted.

Maintenance of the LAW LSM Gallery Containment Building

The protectively-coated concrete floor of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete and protective coating will be free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, including the glass waste and containerized waste and equipment.

Wastes managed in the containment building will not be stacked. Limited storage is expected in the gallery.

Measures to Prevent Tracking Wastes from the LAW LSM Gallery Containment Building

The unit is designed to manage LAW melters. The melters will be disconnected from all systems when determined to be waste. The ports where the melter was attached to all systems will be sealed and any

glass waste will be contained within the melter. This design will prevent waste from entering the containment building and thus from being tracked from the unit.

Personnel access will be limited due to radiological concerns. Access will be required only for non-routine events such as when melters are determined to be waste, once every four to five years, or when equipment must be dismantled. The unit will be classified as a C3 contamination area, which allows only limited personnel access. Dry decontamination methods using maselin cloth will be used. For details of how the unit will keep wastes from being tracked, from the unit by limiting human access and controlling the movement of equipment into and out of the unit, see section 4.2.4.

Control of Fugitive Dust from the LAW LSM Gallery Containment Building

Operational controls and the LAW vitrification plant ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.11101(c)(1)(iv). The following measures will be used to prevent dust from escaping the LAW LSM gallery containment building

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit compared to adjacent C2 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA-filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the LAW LSM Gallery Containment Building

Conditions that could lead to a release from the LAW LSM gallery containment building will be corrected as soon as possible after they are identified. The ventilation system and airlocks, the most likely sources of potential releases, are designed with two stages of HEPA filters, with backup HEPA filters to facilitate repairs and replacement.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to the start of operations. The methods will be followed to repair any condition that could lead to a release.

Inspections of the LAW LSM Gallery Containment Building

An inspection program will be established to detect conditions that could lead to release of wastes from the LAW LSM gallery containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the LAW LSM containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.4. ILAW Container-Finishing Line Containment Building

The ILAW containment building will be located in the LAW vitrification plant, as depicted in Figure 4-56. It will be used for managing ILAW containers that have cooled sufficiently to be closed and prepared for finishing. A container moves from an inert filling room to a weld room, to a decontamination room, and finally to a swab and monitor room, and then is transported out of the containment building. This sequence of rooms is considered a finishing line. There are two finishing lines within the ILAW container finishing line containment building. There are eight rooms in the building: two inert filling rooms, two weld rooms, two decontamination rooms, and two swab and monitor rooms. Specifics on activities performed in the containment building are provided in section 4.3.1.

Each of the two inert fill rooms will be 17 × 14 × 25 ft. high. The outside of the container will be inspected for glass. If glass is found, it will be removed using a needle gun. The glass shards will be collected in a shop-type vacuum and disposed of as secondary waste. The dust will be disposed of as a secondary waste. The temporary lid will be removed and a sample of the glass will be collected as necessary.

Each of the two weld rooms will be approximately 35 × 14 × 25 ft high. Here, a permanent lid will be welded onto the container, and inspected to confirm that it is adequately attached. If the weld does not pass the inspection it may be repaired or a new lid may be welded onto to the container.

Each of the two decontamination rooms will be 18 × 14 × 25 ft high. The decontamination process will be conducted using carbon dioxide pellets to remove contamination. Using a turntable, the container will revolve while a power manipulator tracks the entire surface with decontamination equipment.

Each of the two ILAW swab rooms will be 23 × 14 × 25 ft high. The surface of the container will be swabbed with a soft absorbent material and the radiation levels of the swab will be remotely-monitored. The results will determine whether the container goes to the ILAW container storage area, or through decontamination again or to the ILAW fixative containment building.

4.3.4.4.1. ILAW Container-Finishing Containment Building Design

The ILAW container-finishing containment building will be completely enclosed within the LAW vitrification plant. It will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification plant exterior will prevent water from running into the plant. The approximate dimensions of the unit will be 98 × 31 × 25 ft high.

ILAW Container-Finishing Containment Building Structure

Because the ILAW container-finishing containment building will be a concrete-walled structure fully enclosed within the LAW vitrification plant, its structural requirements will be met by the design

standards of the LAW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the LAW vitrification plant are presented in the SADAR, identified in Appendix 4A.

ILAW Container-Finishing Containment Building Materials

The ILAW container-finishing containment building will be constructed of steel-reinforced concrete. The primary barrier of the inert filling rooms, weld rooms, and swab and monitor rooms is the concrete structure of the unit. A protective coating will be applied to the concrete.

The interior floor and a portion of the walls of the decontamination rooms will be lined with stainless steel. The height of the lining will be determined as design progresses.

The roof of the LAW vitrification plant will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-on.

Use of Incompatible Materials for the ILAW Container-Finishing Containment Building

The primary barrier will have a protective coating. This coating will be compatible with the waste managed in the unit. The waste to be managed include vitrified waste glass within the stainless steel containers. This coating will be present in the two inert fill rooms, the two weld rooms, and the two swab and monitor rooms.

Stainless steel lining will be present in the decontamination rooms. The stainless steel will be compatible with the wastes that will be managed, which will include filled ILAW containers. No glass waste is expected to be present on the exterior of the containers, due to the design of the melter pour stations. The interior is the only portion of the container that will be exposed to the glass waste. Additionally, the removal of any glass will occur in the inert fill rooms. Carbon dioxide pellets, also compatible with the stainless steel, will be used to remove contamination from the container surface.

Reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the ILAW Container-Finishing Containment Building

The ILAW containment building will be designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the LAW vitrification plant will be addressed.

Certification of Design for the ILAW Container-Finishing Containment Building

Prior to start of operations, certification by a qualified registered professional engineer that the ILAW containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because the waste managed in the unit will not contain free liquids and free liquids will not be used to treat the waste.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes a final design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.4.2. Operation of the ILAW Container-Finishing Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the ILAW containment building, as required by 40 CFR 264.1101(c)(1). All activities in the building will be remotely conducted.

Maintenance of the ILAW Container-Finishing Containment Building

The protectively-coated concrete floor and walls of the of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The coated concrete will be free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, which will include glass waste and containerized waste and equipment. Only decontamination chemicals that are compatible with the liner will be used.

The stainless steel lining of the decontamination rooms will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner will remain free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, which will include failed equipment. Only decontamination chemicals that are compatible with the liner will be used.

Wastes managed in the containment building will not be stacked.

Measures to Prevent Tracking Wastes from the ILAW Container-Finishing Containment Building

The ILAW containment building is designed to sample, seal, and decontaminate the filled ILAW containers. Conducting these activities in a C3 zone prevents the spread of contaminated materials from the unit as all air flow is managed in the LAW vitrification plant ventilation system. The containment building is under negative pressure, so no air flow through doors or other openings occurs. Air flow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the plant stack.

A vacuum cleanup system, located in the two inert fill rooms, is expected to be infrequently used to collect dust from the inert filling activities, and thereby minimize the potential for dust to be tracked from the unit. The dust will be disposed of as secondary waste. Additionally, personnel access to the containment building, which is classified as a C3 contamination area, will be limited due to radiological concerns. Access to the unit will be allowed only under limited circumstances, reducing the potential for contacting the waste and tracking it from the unit.

Control of Fugitive Dust from the ILAW Container-Finishing Containment Building

The following measures will be used to prevent fugitive dust from escaping the containment building:

- A HEPA-filtered vacuum system will be dedicated to each decontamination room to collect debris
- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit, compared to adjacent C2 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow

- Safety interlocks to shut down C3 extraction fans to prevent backflow if the C5 system shuts down
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the ILAW Container-Finishing Containment Building

Conditions that could lead to a release from the ILAW containment building will be corrected as soon as possible after they are identified. The ventilation system and airlocks, the most likely sources of potential releases, will incorporate two stages of HEPA filters, with backup HEPA filters to facilitate repairs and replacement.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to the start of operations. The methods will be followed to repair any condition that could lead to a release.

Inspections of the ILAW Container-Finishing Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the ILAW container-finishing containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the ILAW container-finishing containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.5. ILAW Container Fixative Containment Building

The ILAW fixative containment building will be located on the 28 ft elevation of the LAW vitrification plant, in the southeast corner, as shown in Figure 4-57. The unit will be comprised of a fixative booth and curing area. It will be used to manage ILAW containers that have radiological contamination, which must be sealed onto the container to prevent a radiological release hazard. The application of a fixative on containers is considered to be a non-routine process.

Containers filled with ILAW glass waste will be transported to the ILAW fixative containment building, where a fixative will be applied onto the surface of the container to immobilize any radiological activity detected. The dimensions of the fixative booth will be 20 × 12 × 20 high and will have the capacity to manage one container. The containers will then be moved into the ILAW fixative curing area, where the coating will be allowed to set. Container rework may also occur in this area. The dimensions of the ILAW fixative curing area will be 20 × 40 × 20 ft high and this area will have the capacity to manage

eight containers. After curing or container rework, containers will be transported to the ILAW container storage area.

4.3.4.5.1. ILAW Container Fixative Containment Building Design

The fixative containment building will be completely enclosed within the LAW vitrification plant, and will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification plant exterior will prevent water from running into the plant. The approximate dimensions of the containment building will be 20 × 65 × 20 ft high.

ILAW Container Fixative Containment Building Structure

Because the ILAW fixative containment building will be a concrete-walled structure fully enclosed within the LAW vitrification plant, its requirements will be met by the design standards of the LAW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the LAW vitrification plant are presented in the SADAR, identified in Appendix 4A.

ILAW Container Fixative Containment Building Materials

The ILAW fixative containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls will be lined with a protective coating. The roof of the LAW vitrification plant will consist of metal roofing, roof insulation, and a vapor barrier. Run-on will be collected by roof drains and a drainage system with overflow drains.

Use of Incompatible Materials for the ILAW Container Fixative Containment Building

A protective coating will be provided for the containment building. The coating will be compatible with the wastes that will be managed in the unit, which will include filled and sealed ILAW steel containers, and consumables, including metallic parts. No glass waste is expected to be present on the exterior of the steel containers, as they will have been cleaned and decontaminated in the ILAW container-finishing containment building. The fixative selected will also be compatible with the stainless steel. Reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the ILAW Container Fixative Containment Building

The ILAW fixative containment building will be designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the ILAW building will be addressed.

Certification of Design for the ILAW Container Fixative Containment Building

Prior to the start of operations, certification by a qualified registered professional engineer that the ILAW container fixative containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because waste containing free liquids will not be managed in the unit and waste will not be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes a final design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.5.2. Operation of the ILAW Container Fixative Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the ILAW fixative containment building, as required by 40 CFR 264.1101(c)(1). All activities in the building will be remotely-conducted.

Maintenance of the ILAW Container Fixative Containment Building

The protectively-coated concrete floor and walls of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The protective coating will be compatible with all materials that will be managed in the containment building, which will include the glass waste, the fixative, and containerized waste and equipment. Only decontamination chemicals that are compatible with the coated concrete will be used. Wastes managed in the ILAW container fixative containment building will not be stacked.

Measures to Prevent Tracking Wastes from the ILAW Container Fixative Containment Building

The ILAW containment building is designed to apply a fixative to decontaminated filled ILAW containers. Conducting these activities in a C3 zone will prevent the spread of contaminated materials. Limited personnel access and controlled movement of equipment into and out of the unit will decrease the possibility that waste will be tracked from the unit.

Personnel access to the ILAW container fixative containment building, which is classified as a C3 contamination area, will be limited due to radiological concerns. Access to the unit will be allowed only under limited circumstances, thereby limiting the potential for contacting the waste and tracking it from the unit.

Control of Fugitive Dust from the ILAW Container Fixative Containment Building

The following measures will be used to prevent fugitive dust from escaping the ILAW container fixative containment building unit.

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit, compared with adjacent C2 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system designed to maintain negative pressure, and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

A VFD for this unit is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the ILAW Container Fixative Containment Building

Conditions that could lead to a release from the ILAW container fixative containment building will be corrected as soon as possible after they are identified. The ventilation system and airlocks, the most likely sources of potential releases, will be designed with backup HEPA filters to facilitate repairs and replacement.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to the start of operations.

Inspections of the ILAW Container Fixative Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the ILAW container fixative containment building. The inspection and monitoring schedule, and methods that will be used to detect releases from the unit, are included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the ILAW containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.6. LAW Vitrification Plant C3 Workshop Containment Building

The LAW vitrification plant C3 workshop containment building will be located in the northeastern portion of the LAW vitrification plant at the 28 ft elevation, as shown on Figure 4-53. The LAW vitrification plant C3 workshop containment building will be used for decontamination, size reduction and packaging of spent equipment. Simple decontamination of components will be performed to allow contact handling. Waste streams generated within the workshop will be volume reduced as necessary by means of disassembly or other suitable means to fit standard packaging such as drums and/or small boxes.

4.3.4.6.1. LAW Vitrification Plant C3 Workshop Containment Building Design

The LAW vitrification plant C3 workshop containment building will be designed as a completely enclosed area within the LAW vitrification plant. It is designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the LAW vitrification plant exterior will prevent water from running into the plant. The approximate dimensions of the unit are 35 x 40 x 20 ft.

LAW Vitrification Plant C3 Workshop Containment Building Structure

The LAW vitrification plant C3 workshop containment building will be a concrete-walled structure fully enclosed within the LAW vitrification plant. Therefore, structural requirements for the containment building will be met by the design standards of the LAW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the LAW vitrification plant are presented in the SADAR identified in Appendix 4A.

LAW Vitrification Plant C3 Workshop Containment Building Materials

The LAW vitrification plant C3 workshop containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel or a protective coating. The roof of the LAW vitrification plant will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains.

Use of Incompatible Materials in the LAW Vitrification Plant C3 Workshop Containment Building

A stainless steel liner or protective coating will be provided for this unit. Stainless steel or the protective coating will be compatible with the equipment wastes that will be managed. Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the liner or coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the LAW Vitrification Plant C3 Workshop Containment Building

The LAW vitrification plant C3 workshop containment building will be designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the plant will be addressed.

Certification of Design for the LAW Vitrification Plant C3 Workshop Containment Building

Prior to startup of operations, a certification by a qualified independent registered professional engineer that the LAW vitrification plant C3 workshop containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because the waste managed in the unit will not contain free liquids or be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes the LAW vitrification plant C3 workshop containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.6.2. Operation of the LAW Vitrification Plant C3 Workshop Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the LAW vitrification plant C3 containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the LAW Vitrification Plant C3 Workshop Containment Building

The stainless steel lining or protective coating of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner or protective coating will remain free of corrosion or other deterioration because it is compatible with all materials that will be managed in the containment building. The failed equipment that will be managed in the containment building unit will be compatible with stainless steel or the protective coating. Only decontamination chemicals that are compatible with the liner or coating will be used.

Measures to Prevent Tracking Wastes from the LAW Vitrification Plant C3 Workshop Containment Building

The LAW vitrification plant C3 workshop containment building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

Personnel access to the containment building will be limited due to radiological concerns. It will be classified as a C3 contamination area, which allows only limited access by personnel. Wastes leaving the unit will be enclosed within containers. If necessary, these containers will be decontaminated in the unit and subjected to radiological survey prior to release and transportation to a permitted storage area. Equipment leaving the unit will be decontaminated, when necessary, before being released for removal from the cells.

Control of Fugitive Dust from the LAW Vitrification Plant C3 Workshop Containment Building

The following measures will be used to prevent fugitive dust from escaping the LAW vitrification plant C3 workshop containment building:

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair

The VFD for this unit is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the LAW Vitrification Plant C3 Workshop Containment Building

The design and operation of the unit makes it very unlikely that any releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. The ventilation system will also use negative air pressure to keep contamination from areas of lesser contamination, and will use two-stage HEPA filtration to reduce the release of particles. The ventilation system is designed with backup HEPA filters to provide redundant controls and to facilitate repairs or replacement.

Inspections will identify conditions that could lead to a release. Any such conditions will be corrected as soon as possible after they are identified. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to the start of operations. These methods will be followed to repair any condition that could lead to a release.

Inspections of the LAW Vitrification Plant C3 Workshop Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW vitrification plant C3 workshop containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit is included in Chapter 6.

Compliance Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the LAW vitrification plant C3 workshop containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.7. HLW Melter Containment Building

There are four containment buildings located within the HLW vitrification plant. The HLW melter containment building will be located in the central portion of the HLW vitrification plant at the 11 ft elevation, as illustrated by Figure 4-58. A drawing of the unit is identified in Appendix 4A. The containment building will be comprised of the HLW melter cave and the C3/C5 airlock.

The HLW melter containment building will be used for the dismantling and packaging of spent consumables. The types of spent consumables will include waste recirculators, lid heaters, and thermocouples. When spent consumables are ready for change-out, they will be placed on a consumable storage rack while awaiting size reduction. The consumables will be reduced in size by dismantling or cutting the spent equipment, or both. This process will be remotely-conducted on tables in the containment building. The spent consumables will be placed in baskets and lowered into containers in a transfer tunnel that passes under the HLW melter containment building. The airlock cells will be used for packing or unpacking melters or their components.

In case of a HLW melter failure, the melter will be evaluated for meeting the HSSWAC, particularly in terms of the radiological contamination in the HLW glass residue present in the melter, before it is placed in an overpack.

Located within the melter cave will be the HLW melter; the SBS, which will function as part of the melter offgas system; the feed preparation tank; and the feed tank. These tank systems will all have primary and secondary containment, and are addressed under section 4.3.2 above. Therefore, there is no need for secondary containment within the containment building, as the tank systems meet the requirements WAC 173-303-640.

4.3.4.7.1. HLW Melter Containment Building Design

The HLW melter containment building will be completely enclosed within the HLW vitrification plant. The unit will be approximately 35 x 107 x 49 ft high, and will comprise the HLW melter cave and the overpack C3/C5 airlock cell. The unit is designed to prevent the release of dangerous constituents and exposure to the outside environment. The design and construction of the HLW vitrification plant exterior will prevent water from running into the plant.

The only other sources of liquids that will be present in the cave are the waterline to the two film cooler pipe washout spray rings, and the melter water jacket and connecting piping. These clean water lines will be instrumented to detect leaks automatically. A rupture of either water line would be an abnormal event and would require immediate corrective measures. Corrective action would start with closure of the supply line and draining of remaining water outside the cave, and could require feed cutoff and melter idling or shut down. The amount of water that could be released in the containment building would be unlikely to exceed a few gallons, which would rapidly evaporate into the ambient air due to the high temperature in the cave under normal operating conditions.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid wastes managed in the HLW melter containment building are addressed under tank systems (see section 4.3.2).

HLW Melter Containment Building Structure

The HLW melter containment building will be a fully enclosed, concrete-walled structure within the HLW vitrification plant. Therefore, its structural requirements will be met by the design standards of the HLW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the HLW vitrification plant are found in the SADAR, identified in Appendix 4A.

HLW Melter Containment Building Materials

The HLW melter containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel. The height of the lining will be determined as design progresses.

The roof of the HLW vitrification plant will consist of metal roofing, roof insulation, and a vapor barrier. Run-off will be collected by roof drains and a drainage system with overflow roof drains.

Use of Incompatible Materials for the HLW Melter Containment Building

A stainless steel liner will be provided for the containment building. The stainless steel will be compatible with the wastes that will be managed, which will include failed melters and consumables, including air spargers, metallic parts and refractory bricks. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the HLW Melter Containment Building

The HLW melter containment building is designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads, the load combinations, and structural acceptance criteria applicable to the unit will be addressed.

Certification of Design for the HLW Melter Containment Building

Prior to the start of operations, certification by a qualified registered professional engineer that the HLW melter containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because liquid wastes present in the containment building will be managed in tank systems with secondary containment systems, as presented in Section 4.3.2.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes a final HLW melter containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.7.2. Operation of the HLW Melter Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the HLW melter containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Melter Containment Building

The stainless steel lining of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The liner will be welded at each seam. The stainless steel liner will be free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, which will include failed melters and spent equipment. Only decontamination chemicals that are compatible with the liner will be used.

Wastes managed in the containment building will not be stacked. In general, waste will be placed in containers and removed from the containment building.

Measures to Prevent Tracking Wastes from the HLW Melter Containment Building

The HLW melter containment building design and operating methods include several measures that will prevent wastes from being tracked from the unit. Measures that will be implemented include:

- Limiting the movement of personnel and material from the unit
- Using interlocked shield doors to prevent the inadvertent spread of contamination
- Decontamination of materials or containers before they are released from the unit

Personnel access to the HLW cave, which is classified as a C5 contamination area, will be restricted due to radiological concerns. Personnel operating in melter cave C3/C5 airlock will not be in contact with failed melters because they will be encased in overpack containers

Export of equipment from the melter cave will be kept to a minimum by performing in-cave maintenance as far as possible. The design of the cave and equipment includes MSMs, special tools, and a tool import port that will enable maintenance operations to be conducted remotely without removing the equipment from the cave. When equipment must be removed for hands-on maintenance, it will be transferred through shield doors into the crane decontamination area (C3/C5) above the C3/C5 airlock. The C3/C5 doors will be interlocked with shield doors to the adjacent maintenance room, to prevent radiological shine and the spread of contamination. The equipment will be transferred to the maintenance room only after it has been decontaminated.

Spent consumables and wastes will be size-reduced in the cave and exported to 55 gallon drums through a sealed bagless transfer port, which is designed to provide containment of contamination between the C5 melter cave and the C3 drum transfer tunnel. Export of failed melters will be controlled to prevent the spread of contamination. Melters will be transferred into overpack containers that are docked with the shield doors to the C3/C5 airlock.

Control of Fugitive Dust from the HLW Melter Containment Building

Operational controls and the HLW vitrification plant ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.11101(c)(1)(iv). The following measures will be used to prevent dust from escaping the HLW melter containment building:

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit, compared with adjacent C3 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD for the unit is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the HLW Melter Containment Building

Conditions that could lead to a release from the HLW melter containment building will be corrected as soon as possible after they are identified. The ventilation system and airlocks, the most likely sources of potential releases, are designed with backup HEPA filters to facilitate repairs and replacement.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to the start of operations.

Inspections of the HLW Melter Containment Building

An inspection program will be established, as required under WAC 173-303-695, to detect conditions that could lead to the release of wastes from the HLW melter containment building. The inspection and monitoring schedule and methods that will be used to detect a release from the unit are included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Methods to ensure containment of the dangerous waste within the melter, and to govern decontamination, and address release response will be prepared. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.8. IHLW Container Weld Containment Building

The IHLW container weld containment building will be located in the southern portion of the HLW vitrification plant on the 11 ft elevation. Figure 4-59 shows the location of the unit. Located within the containment building will be two cooling and buffer storage areas and two container welding and rework stations. IHLW containers, which have cooled enough to leave the miscellaneous unit pour areas, will be

transported to the IHLW container weld containment building by means of an overhead crane. The IHLW glass waste will continue to cool in the buffer storage areas. When adequately cooled, containers will be moved to one of the two weld and rework cells, where the temporary lid that had been placed on the container will be removed and the permanent lid will be welded onto the container. The IHLW container will then be transported to the IHLW container decontamination containment building. Container management practices are discussed in section 4.3.1.

4.3.4.8.1. IHLW Container Weld Containment Building Design

The container weld containment building will be completely enclosed within the HLW vitrification plant. The design and construction of the HLW vitrification plant exterior will prevent water from running into the plant. The unit is designed to prevent the release and exposure of dangerous constituents to the outside environment. Its approximate dimensions will be 140 × 18 × 48 ft high.

IHLW Container Weld Containment Building Structure

Because the container weld containment building will be a concrete-walled structure fully enclosed within the HLW vitrification plant, its structural requirements will be met by the design standards of the HLW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the structure are addressed in the SADAR, identified in Appendix 4A.

IHLW Container Weld Containment Building Unit Materials

The container weld containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel. The height of the lining will be determined as design progresses.

The roof of the HLW vitrification plant will be metal. Run-off will be collected by roof drains and a drainage system with overflow roof drains.

Use of Incompatible Materials for the IHLW Container Weld Containment Building

A stainless steel liner will be provided for the containment building which will be compatible with the IHLW steel containers that will be managed. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used in the unit.

Primary Barrier Integrity in the IHLW Container Weld Containment Building

The HLW vitrification plant is designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the HLW vitrification plant will be addressed.

Certification of Design for the IHLW Container Weld Containment Building

Prior to the start of operations, certification by a qualified registered professional engineer that the IHLW container weld containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because waste containing free liquid wastes will not be managed in the containment building and the waste will not be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes a final IHLW container weld containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule

4.3.4.8.2. Operation of the IHLW Container Weld Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the IHLW container weld containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the IHLW Container Weld Containment Building

The stainless steel lining of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner will be welded at each seam, and will be free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, including the stainless steel containers. Only decontamination chemicals that are compatible with the liner will be used.

Wastes that will be managed in the containment building will not be stacked higher than any unit wall. Wastes are not anticipated to be stacked.

Measures to Prevent Tracking Wastes from the IHLW Container Weld Containment Building

The IHLW container weld containment building is designed to store cooling IHLW glass waste containers and weld the lids onto the containers.

The outside of the container will be inspected to see whether glass is present on the container. If glass is found, it will be removed using a needle gun, and the glass shards will be collected for disposal in a shop-type vacuum. The waste generated will be disposed of as a secondary waste. For details on how the unit will keep wastes from being tracked from the unit by limiting human access and controlling the equipment into and out of the unit, see section 4.2.5.

The containment building will be classified as a C5 contamination area, and therefore personnel access will be limited due to radiological concerns. Wastes leaving the unit will be within containers.

Control of Fugitive Dust from the IHLW Container Weld Containment Building

Operational controls and the HLW vitrification plant ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.11101(c)(1)(iv). The following measures will be used to prevent dust from escaping the IHLW container weld containment building

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit compared with adjacent C3 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack

- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD for the unit is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the IHLW Container Weld Containment Building

Conditions that could lead to a release from the IHLW container weld containment building will be corrected as soon as possible after they are identified. The ventilation system, as the most likely source of potential releases, is designed with backup HEPA filters to facilitate repairs and replacement.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to the start of operations.

Inspections of the IHLW Container Weld Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the IHLW container weld containment building. The inspection and monitoring schedule and methods that will be used to detect a release from the unit are included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Methods to ensure containment of the dangerous waste within the IHLW container weld containment building and release response will be prepared. Refer to Appendix 4A for the details of the proposed information completion schedule.

4.3.4.9. IHLW Container Decontamination Containment Building

The IHLW container decontamination building will be located in the southeast corner of the HLW vitrification plant at the 11-foot elevation as shown on Figure 4-60. The primary function of this unit is the decontamination of the exterior of the filled IHLW containers.

IHLW containers, which have permanent lids, will be received at the unit. The containers will be washed in a tank with de-ionized water to remove any loose contamination that may be on the surface of the container. The container will then be washed with ceric nitrate and nitric acid to remove a layer of steel as part of the decontamination process. The tank will be drained and the container will then be sprayed with nitric acid. Additional nitric acid rinses may be conducted, if needed. A deionized water spray will then be performed. All tank activities will occur in permitted tank systems which have secondary containment, as addressed in section 4.3.2.

After the decontaminated container has dried it will be transferred to the swabbing station, where its exterior will be swabbed, and the swabs monitored for gamma radiation. When the container is found to meet surface radiological requirements, it will be transferred to the IHLW container storage area.

4.3.4.9.1. IHLW Container Decontamination Containment Building Design

The IHLW container decontamination building will be completely enclosed within the HLW vitrification plant, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. It will be approximately 10 × 80 × 58 ft high. The design and construction of the HLW vitrification plant exterior will prevent water from running into the plant.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid wastes managed in the IHLW container decontamination containment building are addressed under tank systems (see section 4.3.2).

IHLW Container Decontamination Containment Building Structure

Because the IHLW container decontamination building will be a concrete-walled structure fully enclosed within the HLW vitrification plant, its structural requirements will be met by the design standards of the HLW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements that the building must address are presented in the SADAR, identified in Appendix 4A.

IHLW Container Decontamination Containment Building Unit Materials

The IHLW container decontamination containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel. The height of the lining will be determined as design progresses.

The roof of the HLW vitrification plant will consist of metal roofing, roof insulation, and a vapor barrier. Run-off will be collected by roof drains and a drainage system with overflow roof drains.

Use of Incompatible Materials for the IHLW Container Decontamination Containment Building

A stainless steel liner will be provided for the containment building and will be compatible with the IHLW containerized wastes that will be managed. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the IHLW Container Decontamination Containment Building

The IHLW container decontamination building is designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the HLW vitrification plant will be addressed.

Certification of Design for the IHLW Container Decontamination Containment Building

Prior to the start of operations, certification by a qualified registered professional engineer that the IHLW container decontamination containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because free liquids managed in the unit are addressed under tank systems (section 4.3.2).

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes a final IHLW decontamination containment building design

and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.9.2. Operation of the IHLW Container Decontamination Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the IHLW container decontamination containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the IHLW Container Decontamination Containment Building

The stainless steel lining of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner will be welded at each seam, and will be free of corrosion or other deterioration because it will be compatible with all materials that will be managed in the containment building, as well as the stainless steel containers that will be managed. Only decontamination chemicals that are compatible with the liner will be used.

Wastes are not expected to be stacked within the unit.

Measures to Prevent Tracking Wastes from the IHLW Container Decontamination Containment Building

The IHLW decontamination containment building is designed to manage containers which undergo decontamination in tank systems and to swab the containers to determine whether decontamination has been effective. The containment building will be a C5 area. Conducting these activities in a C5 zone will prevent the spread of contaminated materials. The containment building is under negative pressure and therefore no air particulates can escape the unit. The air from the unit passes through HEPA filtration prior to discharge out of the plant stack.

Personnel access to the IHLW container decontamination containment building, which is classified as a C5 contamination area, will be limited due to radiological concerns. Therefore, personnel moving into and out of the unit will not track contamination out of the unit.

Control of Fugitive Dust from the IHLW Container Decontamination Containment Building

Operational controls and the HLW vitrification plant ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.11101(c)(1)(iv). The following measures will be used to prevent fugitive dust from escaping the IHLW container decontamination containment building.

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Greater negative air pressure in the unit, compared to adjacent C3 units, to pull air into the unit and prevent backflow
- Intake air through controlled air in-bleed units with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Safety interlocks to shut down C3 extract fans to prevent backflow if the C5 system shuts down
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack

- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD for the unit is identified in Appendix 4A.

Procedures in the Event of Release or Potential for Release from the IHLW Container Decontamination Containment Building

Conditions that could lead to a release from the container decontamination building will be corrected as soon as possible after they are identified. The ventilation system, the most likely source of potential releases, is designed with two stages of HEPA filters with backup HEPA filters to facilitate repairs and replacement.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to the start of operations.

Inspections of the IHLW Container Decontamination Containment Building

An inspection program will be established as required under WAC 173-303-695, to detect conditions that could lead to release of wastes from the IHLW container decontamination containment building. The inspection and monitoring schedule and methods that will be used to detect a release is included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Methods to ensure containment of the dangerous waste within the IHLW container decontamination containment building and release response will be prepared. Refer to Appendix 4A for the details of the proposed information completion schedule.

4.3.4.10. HLW Vitrification Plant C3 Workshop Containment Building

The HLW vitrification plant C3 workshop containment building will be located in the northwest side of the HLW vitrification plant at the 30-foot elevation, as shown on Figure 4-58.

The HLW vitrification plant C3 workshop containment building will be used for decontamination, size reduction, and packaging of spent equipment. Equipment will be transported to the unit contained in shielded casks or in a standard waste box. In the workshop, the equipment will be decontaminated to enable "hands on" maintenance. Spent equipment parts will be bagged and placed in standard waste containers or boxes for disposal. Size reduction may be performed to facilitate packaging. Other spent equipment will be packaged in 55-gallon drums or standard waste boxes.

4.3.4.10.1. HLW Vitrification Plant C3 Workshop Containment Building Design

The HLW vitrification plant C3 workshop containment building will be designed as a completely enclosed area within the HLW vitrification plant. It will be designed to prevent the release of dangerous waste and their exposure to the outside environment. The design and construction of the HLW

vitrification plant exterior will prevent water from running into the plant. The approximate dimensions of the unit are 27 x 66 x 19 ft.

HLW Vitrification Plant C3 Workshop Containment Building Structure

The HLW vitrification plant C3 workshop containment building will be a concrete-walled structure fully enclosed within the HLW vitrification plant. Therefore, structural requirements for the containment building will be met by the design standards of the HLW vitrification plant. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. The seismic requirements for the HLW vitrification plant are presented in SADAR identified in Appendix 4A.

HLW Vitrification Plant C3 Workshop Containment Building Materials

The HLW vitrification plant C3 workshop containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel or protective coating. The roof of the HLW vitrification plant will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains.

Use of Incompatible Materials in the HLW Vitrification Plant C3 Workshop Containment Building

A stainless steel liner or protective coating will be provided for this unit. Stainless steel or the protective coating will be compatible with the equipment wastes that will be managed. Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the liner or coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the HLW Vitrification Plant C3 Workshop Containment Building

The HLW vitrification plant C3 workshop containment building is designed to withstand all loads from the movement of personnel, wastes, and handling equipment. Design loads and the load combinations and structural acceptance criteria applicable to the plant will be addressed.

Certification of Design for the HLW Vitrification Plant C3 Workshop Containment Building

Prior to startup of operations, a certification by a qualified independent registered professional engineer that the HLW vitrification plant C3 workshop containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because the waste managed in the unit will not contain free liquids or be treated with free liquids.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes the HLW vitrification plant C3 workshop containment building design and certification of design. Refer to Appendix 4A for details of the proposed information completion schedule.

4.3.4.10.2. Operation of the HLW Vitrification Plant C3 Workshop Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the HLW vitrification plant C3 workshop containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Vitrification Plant C3 Workshop Containment Building

The stainless steel lining or protective coating of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner or the protective coating will remain free of corrosion or other deterioration because it is compatible with all materials that will be managed in the containment building. The failed equipment that will be managed in the containment building unit will be compatible with stainless steel or the protective coating. Only decontamination chemicals that are compatible with the liner or coating will be used.

Measures to Prevent Tracking Wastes from the HLW Vitrification Plant C3 Workshop Containment Building

The HLW vitrification plant C3 workshop containment building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

Personnel access to the containment building will be limited due to radiological concerns. It will be classified as a C3 contamination area, which allows only limited access by personnel. Personnel access will be via a C2/C3 subchange room. Equipment will enter and exit the workshop via a C2/C3 airlock. Wastes leaving the unit will be enclosed within containers. If necessary, the containers will be decontaminated in the unit prior to transportation to a permitted storage area. Equipment leaving the unit will be decontaminated, when necessary, before being released for removal from the cells.

Control of Fugitive Dust from the HLW Vitrification Plant C3 Workshop Containment Building

The following measures will be used to prevent fugitive dust from escaping the HLW vitrification plant C3 workshop containment building:

- A cascading air flow from areas of least to greatest potential contamination (i.e., C2 to C3 to C5)
- Intake air through controlled air in-bleed units, with backflow prevention dampers, and air gaps around shield doors sized to prevent backflow
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack
- A multiple fan extraction system designed to maintain negative pressure and cascading air flow at all times, even during fan maintenance and repair
- Personnel ingress and egress through airlocks and subchange rooms

The VFD for this unit is identified in Appendix 4A.

***Procedures in the Event of Release* or Potential for Release from the HLW Vitrification Plant C3 Workshop Containment Building**

The design and operation of the unit makes it very unlikely that any releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. The ventilation

system will also use negative air pressure to keep contamination from areas of lesser contamination, and will use two-stage HEPA filtration to reduce the release of particles. The ventilation system is designed with backup HEPA filters to provide redundant controls and to facilitate repairs or replacement.

Inspections will identify conditions that could lead to a release. Any such conditions will be corrected as soon as possible after they are identified. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to the start of operations. These methods will be followed to repair any condition that could lead to a release.

Inspections of the HLW Vitrification Plant C3 Workshop Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the HLW vitrification plant C3 workshop containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit is included in Chapter 6.

Completion Schedule

As the design of the RPP-WTP progresses, additional information will be provided in this section. Information that will be provided includes methods for reporting and addressing releases from the HLW vitrification plant C3 workshop containment building. Refer to Appendix 4A for details of the proposed information completion schedule.

4.4. Other Waste Management Units

Sections 4.4.1 through 4.4.5 discuss the applicability of the requirements for waste management units that have not been discussed up to this point in the DWPA. Sections 4.4.6 through 4.4.9 describe the applicability of air emission controls, waste minimization, groundwater monitoring, and functional design requirements to the RPP-WTP. References to other sections of the DWPA are provided as appropriate.

4.4.1. Waste Piles [D-3]

The operation of the RPP-WTP does not involve the placement of dangerous waste in waste piles. Therefore, the requirements of WAC 173-303-660, "Waste Piles", do not apply to the RPP-WTP.

4.4.2. Surface Impoundments [D-4]

The operation of the RPP-WTP does not involve the placement of dangerous waste in surface impoundments. Therefore, the requirements of WAC 173-303-650, "Surface Impoundments", do not apply to the RPP-WTP.

4.4.3. Incinerators [D-5]

The RPP-WTP does not include a dangerous waste incinerator. Therefore, the requirements of WAC 173-303-670, "Incinerators", do not apply to the RPP-WTP.

4.4.4. Landfills [D-6]

The operation of the RPP-WTP does not involve the placement of dangerous waste in landfills. Therefore, the requirements of WAC 173-303-665, "Landfills", do not apply to the RPP-WTP.